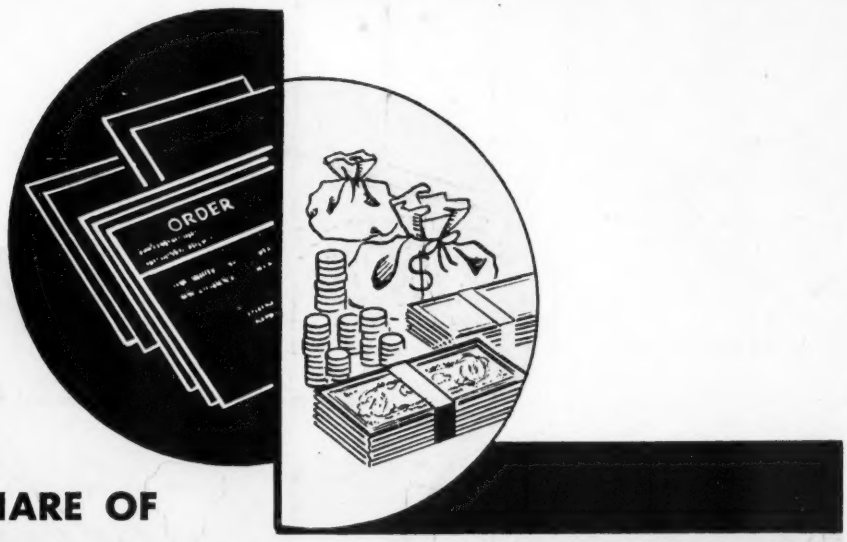
SEPTEMBER 1939

WIRE AND WIRE PRODUCTS



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Many modern wire mills find that the going isn't quite as tough as it's cracked up to be—that after all, it's still possible to make profits out of the manufacture of wire even in today's markets! And when you analyze the operations of these successful concerns, the most striking single factor is the absence of out-of-date, cost-breeding machinery—the mechanical termites which destroy profits at the root.

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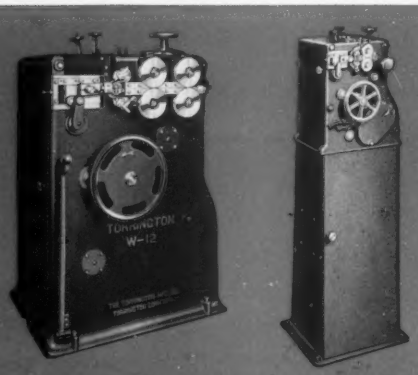
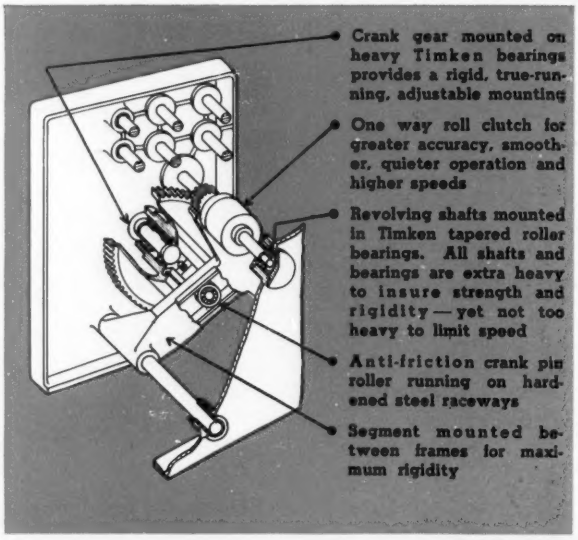
OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

RIGID, COMPACT DESIGN

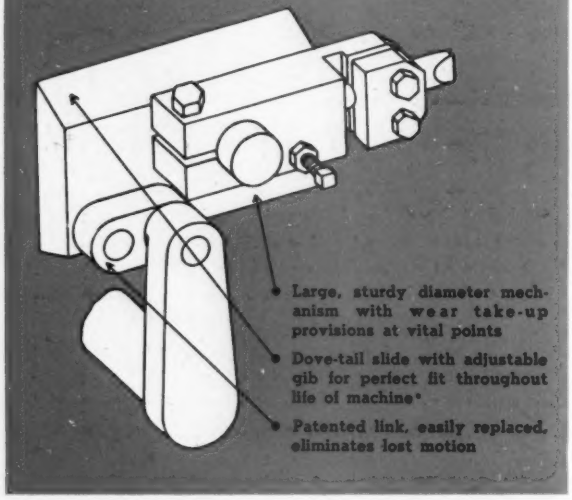
TORRINGTON SPRING MACHINES handle long production runs without breakdowns and costly delays because of great strength and rigidity of all parts. That Torrington Spring Machines "have what it takes" is the proved experience of leading spring makers who are profiting by their use.



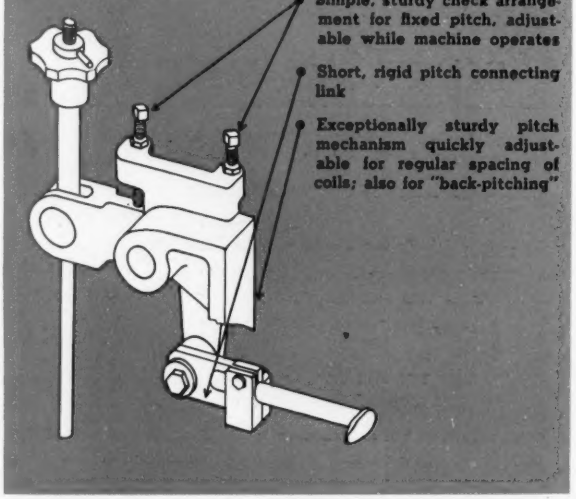
Torrington Segment Type Spring Coiling Machines. Model W-12 (left) Dia. range .047" to .148". Length per Spring, 0" to 60". Model W-10 (right) Dia. range .008" to .028". Length per Spring, 0" to 24". Bulletins list complete specifications for these and other Segment Type models; also Clutch Type Coilers and Torsion Spring Winders.



- Crank gear mounted on heavy Timken bearings provides a rigid, true-running, adjustable mounting
- One way roll clutch for greater accuracy, smoother, quieter operation and higher speeds
- Revolving shafts mounted in Timken tapered roller bearings. All shafts and bearings are extra heavy to insure strength and rigidity — yet not too heavy to limit speed
- Anti-friction crank pin roller running on hardened steel raceways
- Segment mounted between frames for maximum rigidity



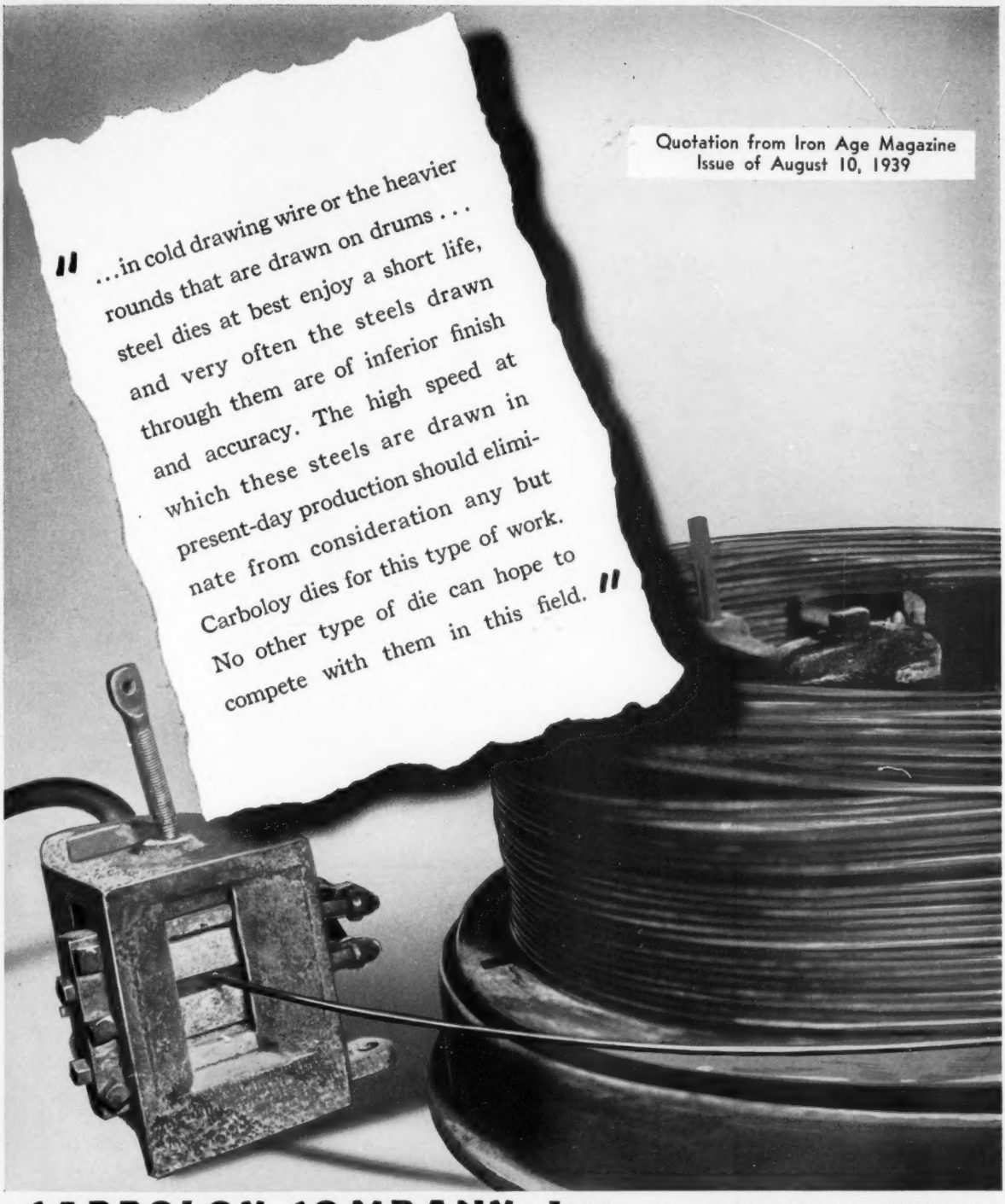
- Large, sturdy diameter mechanism with wear take-up provisions at vital points
- Dove-tail slide with adjustable gib for perfect fit throughout life of machine
- Patented link, easily replaced, eliminates lost motion



- Simple, sturdy check arrangement for fixed pitch, adjustable while machine operates
- Short, rigid pitch connecting link
- Exceptionally sturdy pitch mechanism quickly adjustable for regular spacing of coils; also for "back-pitching"

TORRINGTON
SPRING MAKING MACHINES

ENGINEERED AND MANUFACTURED BY THE TORRINGTON MANUFACTURING CO. of TORRINGTON, CONNECTICUT


Quotation from Iron Age Magazine
Issue of August 10, 1939
" ...in cold drawing wire or the heavier rounds that are drawn on drums . . . steel dies at best enjoy a short life, and very often the steels drawn through them are of inferior finish and accuracy. The high speed at which these steels are drawn in present-day production should eliminate from consideration any but Carboloy dies for this type of work. No other type of die can hope to compete with them in this field. "

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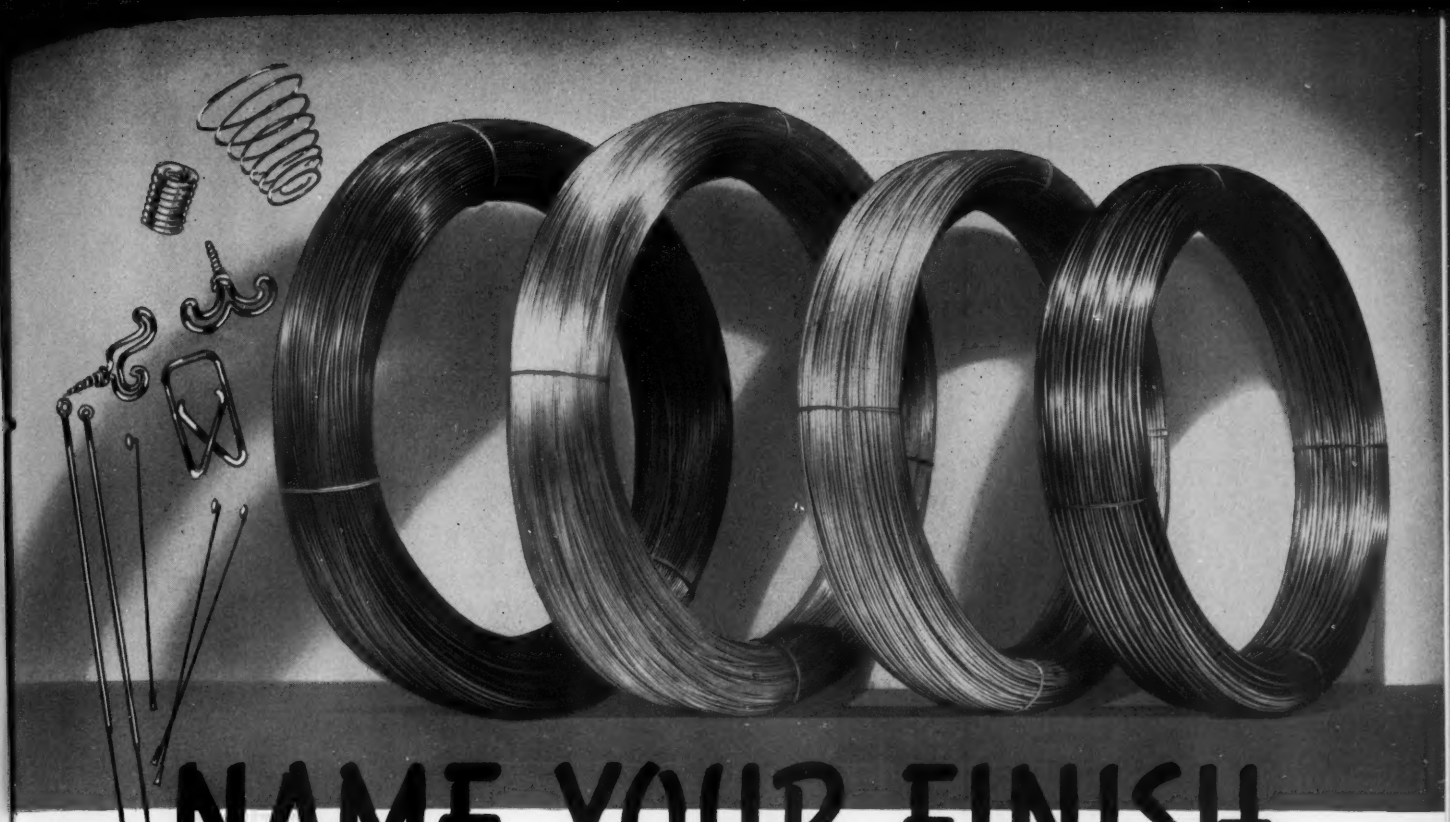
"Why, one of my men heard a paper delivered at the Congress last year that cleared up a machining problem that had us stumped for four months. And another of my boys last year came home with a whole note-book full of ideas he had jotted down after seeing the exhibits at the Metal Show — ideas that made our production 20% more efficient than last year.

"I find it's a good thing for my younger men to get to the Metal Show for at least a couple of days, too. It gives them a broader vision in their work here at our plant — and makes them more valuable to me, and themselves.

"You can bet that I'll be on hand at Chicago for the week of October 23rd — I don't want my boys to know more about recent developments than their president."

National
METAL CONGRESS and EXPOSITION
INTERNATIONAL AMPHITHEATRE
CHICAGO · · · · · Oct. 23-27, 1939



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ALL members of the Wire Association are cordially invited to submit technical papers either for publication in "WIRE & WIRE PRODUCTS" during the year or for presentation before the Annual Wire Association Meeting at Chicago, October 23-27, 1939.

+ + +

FOR 1939 and subsequent years a medal will be awarded in each of the two major divisions of the activities of the Association, to the papers coming nearest to the requirement set forth above.

+ + +

CONSIDERATION for the Medal Awards is not limited to all papers presented at the Annual Meeting, but is given to all papers submitted by members and published in "WIRE & WIRE PRODUCTS" during the year.

+ + +

SELECTION of papers to be presented at the Annual Convention rests in the hands of the Joint Programme Committee of the Wire Association.

+ + +

ALL papers submitted become the property of the Wire Association, and the Board of Directors constitutes the Committee on Awards.

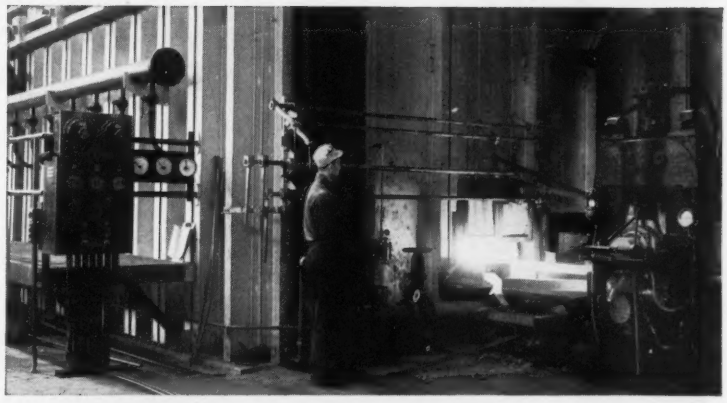
+ + +

ADDITIONAL information may be obtained by addressing:

RICHARD E. BROWN,
SECRETARY, THE WIRE ASSOCIATION
Stamford Trust Co. Bldg., STAMFORD, CONNECTICUT

3-minute inspection trip

explains the workability of BETHLEHEM RODS



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This automatically controlled furnace preheats every billet uniformly from end to end. When each blank is fed into the mill, it responds uniformly to reduction. The finished rods are sound and of uniform quality.

Look at the mill

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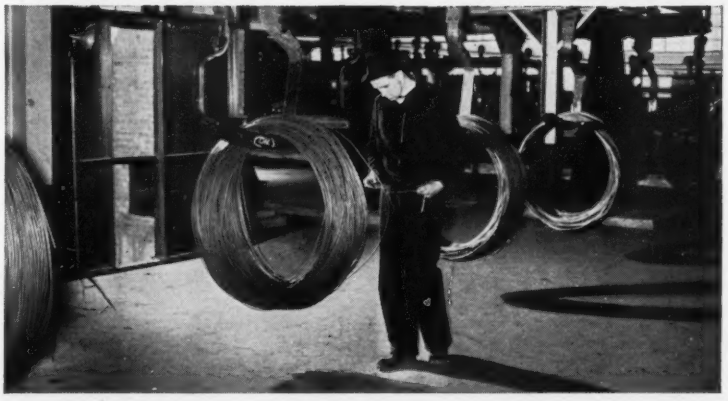

Look at the inspection line

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They make certain that only top-quality, workable rods are released for shipment.

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LET US QUOTE ON YOUR WIRE REQUIREMENTS

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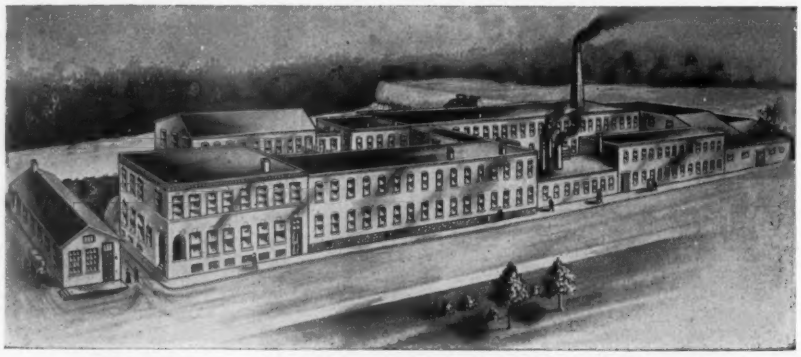

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WINCO enamelled wire is lower in cost than silk covered wire. Write for sample.

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WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable

DRAWING—ROLLING—EXTRUDING—FORMING—FABRICATING

Vol. 14 SEPTEMBER, 1939 No. 9

Designated as

Official Publication By The Wire Association

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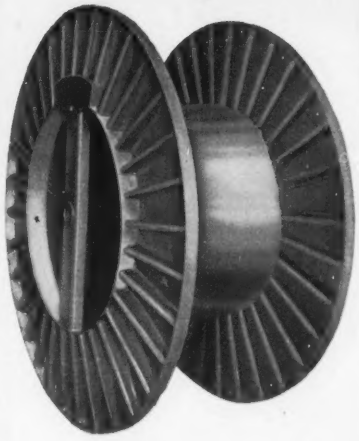
FOR REEL ECONOMY



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WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip.
Wire Products and Insulated Wire and Cable.
DRAWING --- ROLLING --- EXTRUDING --- FORMING --- FABRICATING

Vol. 14 SEPTEMBER, 1939 No. 9

Bolt Making In Scotland

By A. P. Newall,
Managing Director,
A. P. Newall & Company, Ltd., Glasgow, Scotland

A description of the modern plant of the Woodside Engineering Works of A. P. Newall & Company, Ltd., Glasgow, Scotland. ✦ ✦ ✦ ✦ ✦

THE **Woodside Engineering Works** are situated at the North-west corner of the city of Glasgow, and are on the main road to the Scottish Highlands; in fact less than three miles from the works you come to a point in the road where you obtain a magnificent view of Ben Lomond. The factory itself is on the main road, and sits well back, the intervening space being occupied by a garden, in which are grown a wide variety of shrubs and flowers.

✦ ✦ ✦

HOWEVER, inside the plant the picture is very much that of an ordinary American factory engaged in the manufacture of bolts and nuts. All the well-known machine tool makers are represented—The National Acme Company, National Machinery Company, Brown & Sharpe, Pratt & Whitney, Warner & Swasey, Budd-Ranney, Manville, Waterbury Farrel, and many others.

A. P. NEWALL

Mr. A. P. Newall established the business of A. P. Newall & Company Limited in 1901. He is a member of the Institution of Mechanical Engineers, the Institution of Automobile Engineers, and the Institution of Engineers and Shipbuilders in Scotland. He is also a member of the Iron & Steel Institute, the Institute of Metals, and the British Standards Institution. For many years he has been a member of the American Society for Metals and The Wire Association.

THE main product of the factory is **"Newall Hitensile"** Heat-treated Bolts, which are made from S.A.E. 1035, and heat treated to give a tensile strength of 45/55 tons. These bolts were the first hardened and tempered branded bolts to be placed on the market.

✦ ✦ ✦

THERE are quite a number of different types of bolts manufactured, including **"Newalloy"**, made from Alloy Steel and heat treated to give a tensile strength of 65/75 tons.

✦ ✦ ✦

AS might be expected, Aircraft Bolts take a prominent place in the programme of manufacture, and are made in various materials, including Stainless Steel.

✦ ✦ ✦

A CONSIDERABLE part of the factory is devoted to the manufacture of bolts for the British Admiralty. These run in sizes up to 1½" diameter, and are made from Acid Steel to the Admiralty's own special specification.

Designated as Official Publication by the Wire Association

SPECIAL parts such as Shackle Bolts and Spring Pins are made from varying qualities of Case-hardening Steels, and we also manufacture a considerable number of bolts for high temperature work, where the steel has to possess non-creep qualities. It will thus be seen that this is a factory of highly-specialized manufacture.

✦ ✦ ✦

EVERYTHING, practically speaking, has to be made to the closest possible limits, and Class 3 and even Class 4 fits are not uncommon. Much of the work is passed through Centreless Grinders, and frequently ground to a limit of .0005".

✦ ✦ ✦

IT will be appreciated that in manufacturing this type of bolt great care has to be taken with the raw material. This is delivered in the form of wire rods and bars. All wire rods are checked for Carbon and Manganese, which is duly recorded in the Steel Book.

✦ ✦ ✦

Cleaning and Pickling

READERS of "Wire & Wire Products" will naturally be interested in the Wire Drawing Section. The pickling is done in a rectangular tank measuring 26 ft. long x 4 ft. 6" x 5 ft. deep. This tank is of rather a peculiar design, having been built from reinforced concrete of a thickness of 8". It is lined with alloyed lead, and then there is a lining of blue brick. This type of tank has proved itself very effective in service, and has already shown a long life.

✦ ✦ ✦

THE wire rods are loaded on cradles, and we are showing a photograph of this, as probably being of interest to you in as much as it is a departure from your standard practice. For our purpose it works out very well.

✦ ✦ ✦

THE pickle used is 5% Sulphuric Acid, with Rodine as the inhibitor.

✦ ✦ ✦

AT the back of the pickling tank is a cowl with an exhaust fan, which has proved very effective. Alongside the acid tank is a water tank of practically the same size, but it is entirely made of reinforced concrete, and is used for washing the acid in the first stage, though a hose is used subsequently with water at a pressure of 350 lbs.

✦ ✦ ✦

THE lime bath is also made of reinforced concrete. Liming is done with hot hydrated lime, and is kept well stirred. This is used in conjunction with the Morrison Flash Baker, and four dips and four baking operations are found very satisfactory. We find that this gives us an excellent surface for drawing, and as we are working with "National" Boltmakers the double extrusion process is assisted enormously by this combined baking and liming method.

✦ ✦ ✦

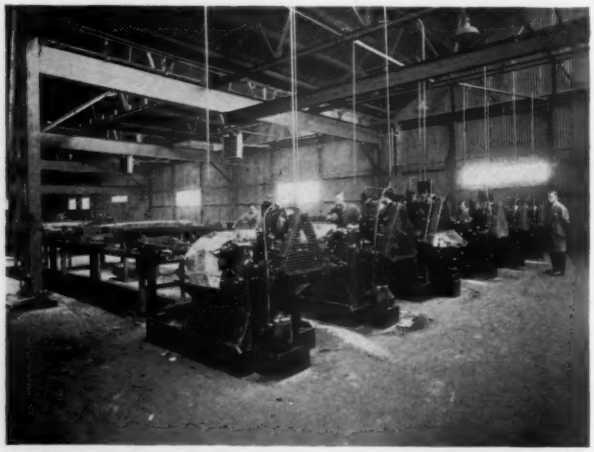
Wire Drawing

THE draw blocks are manufactured by a British firm, and are arranged in rather a different way from the well-known Vaughn type, but the Vaughn reel is used. The type of block employed has two motors; slow movement takes the wire on to the block, and immediately it is established there the ordinary speed motor is set in motion. The drive is through a gear box, which makes many variations in speed possible. So far as can be arranged, the dies are made from Tungsten Carbide. The bars are drawn on a double bench operated with variable speed motor of 120 H.P., and it will be appreciated that with the great variety of steel used in this factory running from ordinary S.A.E. 1035 to Stainless Steel that such differences in speed are very essential.

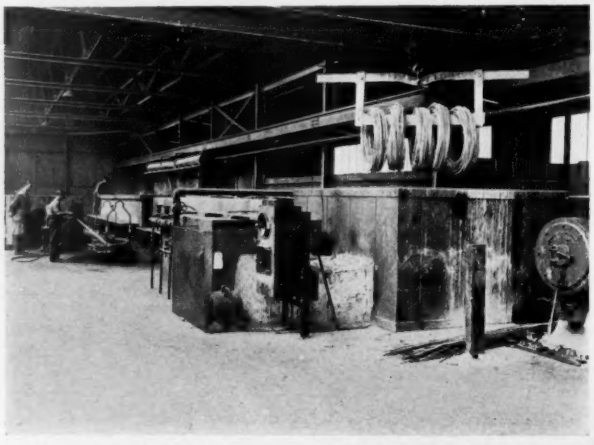
✦ ✦ ✦

Cold Heading

BOLTS up to ⅝" diameter are made on Cold Headers chiefly of the **Manville** type, but there are four **"National Boltmakers"** in sizes



General view. End of Wire Mill showing battery of automatic machines.



Handling wire rods in cleaning room.

✦ ✦ ✦

from 5/16" to ½". These machines have given us very great satisfaction, and produce an article in our view of much superior quality to what was obtainable from the Double Blow Header.

✦ ✦ ✦

LARGER size bolts are made by varying hot-heading methods. One that might prove of interest to you is where we heat on an electric upsetter, and finish on a "National" High Duty Forging Machine.

✦ ✦ ✦

Heat Treating

WE try as far as possible to avoid turning bolts, and therefore make from cold-rolled stock, giving them a grinding operation after heat treatment.

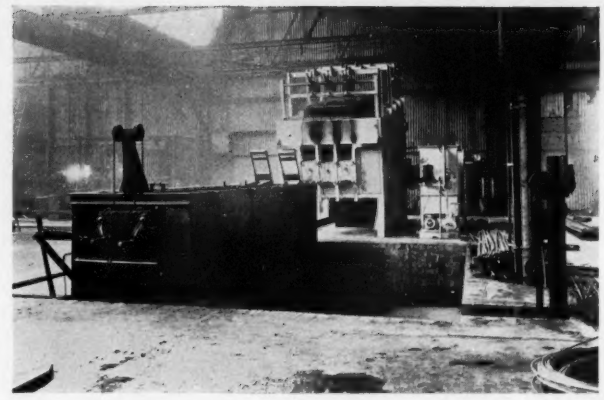
✦ ✦ ✦

AS so much of our product has to be heat treated this has necessarily meant that a great deal of attention had to be given to this department. We were early in the field in regard to the use of electric furnaces, and we were happy to get in touch with the Birmingham Electric Furnaces Limited, whose co-operation in this matter has been most helpful. The type of furnace used by us is also manufactured in America by American Furnaces of Salem, Ohio, and our English friends and they have been in close collaboration for many years. We use a neutral atmosphere, ordinary town gas put through the normal processes to give the proper mixture. After more than ten years' experience with this type of furnace we are very satisfied with the results.

✦ ✦ ✦

Magnetic Testing of Aircraft Bolts

IN connection with the manufacture of Aircraft Bolts we have to give 100% check to see that no cracks are in the steel. This is done by an electric magnetic arrangement of which we show a photograph. The bolts are charged with electricity, and are then dipped into a mixture of oil and ferrous-oxide; if there are any cracks they show up very clearly.



Heat treating bolt stock.

✦ ✦ ✦ ✦

✦ ✦ ✦

Inspection

INSPECTION is a very important matter indeed, as so much of the work is made to close limits, and all products are subjected to final inspection before passing into the Despatch Room. Rockwell Machines are at the end of the track, and a number from each pan is taken out and tested for hardness. However, in the case of carburized material 100% Rockwell test is made.

✦ ✦ ✦

Electric magnetic inspection of aircraft bolts.

✦ ✦ ✦

The Tool Room

AS would be expected in such a plant, the Tool Room is of vital importance, and is quite an expensive item. Most of the tools used in the factory are made here. Roll threading dies get a good deal of attention, and the hobs from which they are made are ground to a limit of .0002". Threads are checked on a Zeiss Projector with thirty magnifications.

✦ ✦ ✦

Grain Size

WE know there are wide variations of opinion in regard to such matters as grain size, but for many years now we have adopted the principle of checking for this, and maintaining **McQuaid-Ehn** grain size of 3 to 4 on all bolts up to about 7/16" diameter. These are, of course, oil quenched. Larger sizes are frequently water quenched from material with a grain size of 6 to 8. We can certainly say that since this method was adopted we have rid ourselves of many of our heat treatment problems.

✦ ✦ ✦

Plant Inspection

WE would like to say that our plant is open to any of the readers of "Wire & Wire Products" to inspect and provided they give us due notice we will always be happy to receive them. We ourselves have received so much courtesy at the hands of American manufacturers that it is always a real pleasure when we have the opportunity to reciprocate. Further if any of the Wire & Wire Products readers have points in regard to what we have written to raise with us we will be very glad to enter into correspondence with them.

Present Practice in the Heat Treatment of Non-Ferrous Metals and Alloys

By Ralph D. Hawkins,

The Bridgeport Gas Light Co., Bridgeport, Conn.
Chairman, Non-Ferrous Metals Committee,
American Gas Association

The report of the Non-Ferrous Metals Committee, Industrial Gas Section, The American Gas Association, 1938. Published here by permission of that Association.

✦ ✦ ✦

Introduction

IN view of the fact that considerable material has been written in recent years concerning specific problems of the Non-Ferrous metals industry and concerning applications of gas thereto, your committee feels that a brief resume of the brass and copper industries particularly covering the successive operations through which an ingot of copper or brass may pass before it reaches the finished stage would probably be of interest and value at this time. It is the intent, therefore, of this report to discuss each of the five major divisions into which the processing of non-ferrous metals and alloys may be divided. These would consist of:

1. **Sheet Mills**
2. **Tube Mills**
3. **Wire Mills**
4. **Rod Mills**
5. **Fabricating Plants**

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A COMPLETE discussion of each of these five classifications is, of course, beyond the scope of this report. We will, however, describe briefly the major operations in each division and their requirements in terms of fuel and equipment as far as generally accepted practice is concerned. Wherever possible we shall also point out general trends which indicate what may be expected in the future in the way of new equipment or developments.

NOTE: A preliminary report of the 1938 Non-Ferrous Metals Committee was presented in the form of a paper prepared jointly by the chairman, Ralph D. Hawkins, The Bridgeport Gas Light Co., Bridgeport, Conn., and Oliver D. Pritchard, The Brooklyn Union Gas Co., Brooklyn, N. Y. This paper, entitled "Improvements in Crucible Melting with Gas," was delivered at the American Gas Association Conference on Industrial Gas Sales held in Pittsburgh, Pa., March 7 and 8, 1938.

Sheet Mills

BEFORE being fabricated into sheet copper and brass it is cast in the casting shop in the form of billets, generally termed cakes, or bars in the industry. Bars measure ¾" to 1¾" thick, by 4" to 14" wide, by 20" to 54" long, and will weigh from 40 to 250 pounds. Cakes measure from 2" to 5" thick, from 10" to 18" wide, and from 24" to 48" long. These cakes will weight from 300 pounds to 800 pounds at present with a tendency towards increasing the weight to a thousand pounds or more. These cakes come from the casting shop in an "as cast" condition and are generally covered with a thin coating of oxide and mould dressing. In the mill they receive their first reduction by means of rolling. The bars are cold-rolled and the cakes are hot-rolled. We shall consider first the hot-working metals and alloys.

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Hot Mills

COPPER and in general the following combinations:

Copper
Copper Silicon
Low Copper Tin (Less 5% Tin)
Copper, Zinc, Nickel Alloys
High Brass
Muntz Metal Alloys

are worked hot in the first, or break-down mill. However, many of the above alloys are cold-rolled. The rolling temperature of these materials will vary from 1,250° to 1,950° Fahrenheit. At the proper rolling temperature they are passed through the first stand of rolls and finally reduced in gauge to approximately ⅜" to ½" in one heat. Extremely heavy cakes may require reheating.

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THE furnace in which these cakes are heated may be of a number of different designs depending upon requirements of the particular plant. At present there are two general designs which have received rather wide acceptance. The first is a conventional pusher type furnace where the cakes are pushed through one against the other and discharged at the other end of the furnace on to a take-away mechanism generally consisting of a roller table. Originally the cakes were charged at the charging end on a horizontal table sufficiently long to hold several cakes. Recently these furnaces have been arranged with a magazine feed, which will hold ten or more cakes in a vertical stack eliminating the necessity of charging at very frequent intervals.

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THE other type of furnace has a rotating hearth and is used in those plants where they feel that the increased cost of the equipment is justified by having a furnace which is self-emptying. In furnaces of this type the cakes are charged on to supports on a rotating hearth. The hearth moves one position and a hot cake is discharged either through the same door, which is used for charging, or through a door immediately ad-

jacent to it. This type of equipment has the advantage that the furnace may be completely emptied at the end of a run without the necessity of pushing the last cakes out of the furnace with blanks or dummies as is the case in a pusher-type furnace. The rotating hearth furnace, also, in some mills, has an advantage from a material-handling standpoint in that the work is charged and discharged at a common point, with a single operator. The acceptability of this latter feature, however, is so closely tied in with mill lay-out and flow of material through the mill that it is impossible to list it as a definite advantage. This furnace is well adapted, when gas-fired, for control of atmosphere. Regardless of the type of furnace used for cake heating it is necessary that the cakes be protected from immediate contact with the refractory hearth by the use of alloys. Copper and copper alloys at ordinary rolling temperatures are quite soft and will pick up dust or minute particles of refractory, which are always present on the hearth of a furnace. Should such particles be picked up they will, of course, be rolled into the surface of the cake and the indentations formed will not always be eliminated by succeeding operations.

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THE capacity of cake-heating furnaces is determined by the capacity of the hot mill. The older mills had a maximum capacity of approximately six thousand pounds per hour. New mills, which are being built today, are processing as high as thirty thousand pounds per hour.

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FUELS for cake heating are largely chosen by the economics involved. Those plants, which have been educated to the use of gas on their other processes over a period of years, will generally recognize that the close control possible with gas both in temperature and atmosphere will pay for a rather wide spread in fuel cost.

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THE control of atmosphere on this operation is important. The furnace and burner equipment should be so constructed as to keep free oxygen within the furnace to a minimum. In many cases, after rolling, the surface of the material is milled off to remove the accumulation of oxide incurred during heating and rolling. With control of atmosphere, the amount of milling is materially reduced even though the work is cooled in the open air with a resultant accumulation of oxide.

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Cold Mills

PRACTICALLY all alloys of copper, brass and nickel, whether containing tin, silicon, lead or small amounts of other elements, are cold rolled.

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CERTAIN of the above alloys such as high tin and lead are "hot short" or brittle at temperatures sufficient for hot rolling. These materials are, therefore, processed from the cake cold. Since they are worked cold it is impossible to reduce the section as drastically as is done in hot mills. Ordinarily, cakes will be reduced 50% before reannealing. The first two anneals after the cake starts through the mill are generally known as "break-down anneals" and the cake in this stage of process becomes a slab. The ambiguous term "bar" is used in the nonferrous industry to indicate both cakes and slabs. However, in this report we shall use the terminology of the furnace equipment manufacturer. The slabs on the first break-down anneal will generally run from twelve to fifteen feet long by approximately one-inch thick and the slabs for the second breakdown anneal will run from twenty-five to twenty-eight feet long by approximately three-eights inch thick. These dimensions will, of course, vary depending upon the original size and weight of the cake.

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A SOMEWHAT wider variety of furnaces can be used for annealing slabs than is used for heating cakes. Probably 95% of the slabs today are annealed in pan-type furnaces where the slabs are piled from five to ten high and drawn into a furnace chamber on pans, or trays. Heating cycles are quite long because it is necessary for the heat to penetrate a large mass of metal. Uniformity of anneal varies because the outside slabs always come to temperature ahead of those in the center of the stack. As a result, if the furnace is operated at a temperature head, or if the annealing cycle is too short, the outside slabs are always softer than those on the inside. In the past the non-ferrous industry generally considered that uniformity was not necessary during the breaking down and that any discrepancies in grain size would be evened out during subsequent rolling and annealing. Today the more modern plants feel that a fairly close control during the break-down period will eliminate a great many difficulties in the later processes and will result in a better and more uniform final product.

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AS a result, continuous furnaces are finding greater acceptance today for annealing during the break-down anneal. The design of these furnaces is again determined by mill capacity. The larger mills, having a capacity of ten to twenty thousand pounds per hour, are using walking-beam furnaces, which are completely automatic—the work being charged from a magazine feed and discharged into piles, which may be conveniently picked up by cranes and transported for further processing. Smaller mills find that roller hearth furnaces or pen-conveyor furnaces will satisfy their requirements admirably.

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AS in the case of the cake heaters, control of atmosphere is again important. The general trend, today, is to overhaul the slabs after the final break-down anneal. Any oxide formed in the annealing furnace may be pickled off, but casting defects and inclusions of mould dressing must be machined off. As a result gas finds itself again in a competitive field. Of the last three installations of continuous slab annealers, two are oil-fired and one, where natural gas was available, is gas-fired.

Run Down Annealing

AFTER the metal is formed either from the hot mill, or from the cold mill, all processing thereafter is by means of cold rolling. The number of anneals necessary between the break-down and the finish is determined entirely by the gauge at which it is desired to finish the product. Ordinarily in a cold-rolling operation the section of the metal is reduced approximately 50% of its original thickness before annealing. Those reductions which take place before the sheet is ready to finish are known as run down passes and the intermediate anneals are known as run down anneals.

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WHEREAS the slabs are always handled in straight lengths, the sheet is almost invariably coiled after the first run down and is, thereafter, handled through the mill in coils. This applies to all widths except wide sheet, which may be said to be any width over twenty-four inches. Since very few mills manufacture wide sheet we may for the moment neglect the processing of this material and say that all sheet is coiled.

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RUN Down annealing is done in almost as many different types of furnaces as there are mills. The majority of coils are annealed in pan-type furnaces either double end, or single end batch. These furnaces have found a wide acceptance primarily because they are low on initial investment cost. They can be built to maintain an accurate control of atmosphere and the operating cost can be maintained at a very low level.

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THE average pan-annealing furnace will consume from .5 to .65 cu. ft. of 530 B.t.u. gas per pound of brass or copper depending upon the size of the furnace and the manner in which it is loaded.

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RECENT installations have included a number of roller hearth furnaces where the coils have travelled directly upon the rolls. These furnaces have been built as straight through furnaces and as hairpin furnaces. In the latter case the furnaces are ordinarily constructed as two deck furnaces with the coils being charged on the upper deck proceeding to the end of the furnace where they are lowered by a lowerator device and returned underneath the top deck. In this case the furnace is charged and discharged at the same end and the excuse for this type of construction lies in the fact that a certain amount of recuperation is obtained through a heating exchange chamber wherein the outgoing hot work dispenses a portion of its heat to the incoming cold work. These furnaces will ordinarily operate at a higher efficiency than a straight through furnace or a pan type furnace and will generally operate on about .4 to .45 cu. ft. of 530 B.t.u. gas per lb. of brass, or copper. They are, of course, more expensive than a conventional type of furnace and can only be installed where the fuel saving will justify the increase in investment.

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AS far as atmospheres are concerned during the run down anneal we may say that the general trend is toward the controlling of atmosphere on copper where sub sequent pickling operations can be eliminated. On brass or other zinc bearing alloys atmosphere is controlled to give as clean an anneal as possible, but no attempt is made today to actually produce bright annealed brass. We find, today, that the industry is giving more and more consideration to the possibility of rolling through the run down passes without pickling in spite of the fact that there may be a thin film of zinc oxide on the surface of the material. At the present time, to our knowledge, however, no mill is doing this.

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DURING the run down annealing period the matter of temperature control and uniformity of temperature distribution is extremely important to the finished metal. This fact is commonly accepted today by the non-ferrous metals industry and is the cause of a wide acceptance of gas as a run down annealing medium. It is in this field that gas finds its very definite place in a brass, or copper mill since here cost is secondary to quality of production.

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Finish Annealing

THE finish annealing equipment generally handles the last two anneals on copper or brass sheets. These are known in the trade as the ready-to-finish and finish anneals. Ordinarily the reductions during rolling at this stage of the process are handled in special rolls, which are carefully maintained and polished to obtain a high lustre on the surface of the sheet.

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IN general we may say that the same conditions, as far as furnace equipment is concerned, applied to final annealing, have already been discussed under run down annealing. We may, also, say that temperature control and surface condition are even more important during the finishing operations than they were during any of the preceding operations. Generally, also, batches of material will be smaller since different customers require sheet of different hardness, as well as different widths. The final hardness is controlled by the final annealing temperature. The finish annealing furnaces must be flexible to the point of having the ability to handle relatively small batches, at varying annealing temperatures. As the result of these requirements the finish annealing furnaces are ordinarily smaller in size. Convection heating has made its appearance in this operation and we feel that this method of heating will find a much wider acceptance in the future. Bell-type furnaces have been applied, and there is a definite possibility that this method of annealing will become popular in the brass and copper industry just as it has in the steel industry, due mainly to its ability to handle a wide variety of time temperature cycles in small batches efficiently.

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Tube Mills

THERE are several different processes by which copper and copper alloys may be fabricated into tubing. The metal may start

as cast billets which are worked hot; the metal may start in the form of a hollow cast shell—4″ to 16″ in diameter which is worked cold; or the metal may start as a flat circular plate which is cupped and cold drawn throughout the entire process. As far as heat treatment is concerned the last two operations will have the same run down and finish anneals as will the hot-working process. For all practical purposes, therefore, in this discussion no special mention will be made of the heat-treatment of material which starts as a cast shell, or as a flat circular plate.

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THERE are two common processes for hot working billets into tubing. These consist of piercing mill and the extrusion process. In the piercing mill a hot billet is forced over a mandrel by means of driven rolls and the metal is actually rolled from a round solid billet into a tube, the internal diameter of which is equal to the diameter of the mandrel. In the extrusion process a hot billet is placed in a hydraulic press, the center is punched out by means of a punch and the remainder of the billet is forced under high pressures between the punch and the walls of a die into the form of a tube.

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ORDINARILY, it is possible to handle a wider range of sizes on a piercing mill than is the case in the extrusion process. The rough tube coming from the piercing mill may run from 2½″ to 10″ in diameter while that coming from the extrusion process would generally run between 2″ and 3″. Temperatures encountered on a piercing mill will generally run in the neighborhood of 1,650° F. A wider range of temperatures will be found in the extrusion process, the limits being between 1,250° and 2,000°.

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Billet Heating

REGARDLESS of which process is used, the requirements as to furnace equipment will be almost identical. The furnace capacities will run from 5,000 lbs. to 20,000 lbs. per hour, depending upon the process and size of the mill or press. Billet sizes will run from 6″ to 12″ in diameter and from 8″ to 24″ long in the extrusion process and from 4″ to 10″ in diameter by 24″ to 48″ long in the piercing mills.

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A GREAT variety of furnace designs is used for billet heating. Since all of these billets are round, the most common type of furnace is an inclined hearth or roll-down furnace where the billets roll through the furnace by gravity. This furnace has obtained wide acceptance because it is generally cheap to construct and is self-emptying. Several rotary hearth furnaces have been used for this type of billet heating. Several plants are using pusher furnaces where the billets are pushed on V-type supports, end to end. Other plants are using walking-beam furnaces and recently one plant has installed a car bottom furnace consisting of a number of small cars which move progressively through the furnace.

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IN all cases, control of furnace atmosphere is important in this operation. As a result gas is finding wide acceptance as a heating medium. In one plant where the cost of gas was high, oil was used for heating, but the billets were pushed through a series of tubes which were filled with raw city gas as a protective atmosphere. This operation will present a large field for gas as new equipment is installed to replace old and obsolete furnaces.

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Run Down Annealing

AFTER the initial break-down the tubing is reduced in section by means of either a draw bench where the tube is drawn between a die and a mandrel or by means of a tube-reducing machine where it is worked by means of reciprocating rolls.

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AS a general rule the reductions are considerably more in the latter case than in the former with the result that fewer run down anneals are necessary where tube-reducing machinery is employed. Almost always the run down anneals are handled in straight lengths. Temperatures will run from 1,100° to 1,600° depending upon the alloy. These anneals are handled in pan-type furnaces or by means of roller hearth furnaces. Ordinarily, no attempt is made to obtain other than a clean anneal. The trend, however, is toward bright annealing during the run down. On copper and cupro nickel it is possible to obtain a bright anneal in direct-fired gas furnaces followed by a spray quench. The small amount of water staining from spray quenching the work is not serious or important at this stage of the manufacturing process. We may say that practically 100% of the run down annealing furnaces for tubing are direct-fired and that 90%, at least of the recent installations, have been gas-fired.

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Finish Annealing

A RELATIVELY large percentage of non-ferrous tubing is shipped soft. This material must, therefore, receive a finish anneal. The smaller sizes of tubing are generally handled in coils. The larger sizes are handled in straight lengths, and in some cases small tubing even down to ¼″ may be shipped as straight lengths. Furnaces for finish annealing must, therefore, be capable of handling either straight lengths or coils. The variety of furnaces used is rather large. The finish annealing furnace must be flexible, not only from a standpoint of annealing different sizes of work, but also from a standpoint of handling a multiplicity of small batches requiring varying heat treatment.

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FINISH annealing furnaces will include the following—Batch Type Pan Furnaces, Continuous Pan Furnaces, Roller Hearth Furnaces, and Mesh Belt Furnaces. These may be direct-fired; they may be muffle-type furnaces; or they may be fired by radiant tubes or heated by electricity, with a gas atmosphere. The work may be spray quenched, or slow cooled in a dry gas atmosphere. As a general rule, slow cooling is used only for deluxe tubing where the ultimate user is very particular as to

finish and appearance. A good example is the tubing used in the manufacture of refrigerators.

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SOME tubing in straight lengths is annealed by the Snead Process where the tubing is clamped between two terminals containing low voltage high amperage current. In this process the tube itself serves as a resistor and the necessary annealing temperature is developed by the resistance of the tube.

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A GREAT deal of copper tubing is still annealed in Kenworthy type furnaces. This furnace makes use of a water seal through which the tubing is charged and discharged, the heating being done inside of a metal muffle. The atmosphere utilized is steam which is generally satisfactory for copper. We might mention that there are very few recent installations of this type of furnace.

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ANOTHER type of furnace which is slowly obtaining acceptance is the Bell Type Furnace which lends itself very readily to batch type operation and to the application of the proper type of atmospheres for particular classes of work.

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IN all finish annealing control of atmosphere is of primary importance. Gas, therefore, finds a ready market in this field. Since the ultimate consumer is becoming more and more particular as to the appearance of his tubing and its metallurgical uniformity, the general trend today is toward equipment which makes possible the final annealing of this material without the necessity of using extreme temperature heads. As a result, continuous furnaces are gaining wide recognition and by the same token the bell type furnace which makes use of convection heating is finding its place.

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Wire Mills

Billet Heating

THE copper and copper alloys are cast into square billets known as wire bars, which form the raw material for the wire mill. These billets are heated in wire bar furnaces and are hot rolled into round rod. The wire bars will vary in size and weight. These bars will generally run from 3″ to 6″ square and 4′ to 6′ long. The furnace capacities will run from 15,000 lbs. to 25,000 lbs. per hour.

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IN the past the majority of wire bar heating furnaces were pusher type furnaces fired with oil. The more recent installations have been largely fired with gas. The pusher type of construction has the disadvantage that it is not self-emptying which necessitates either emptying the furnace by pushing dummies or leaving a furnace load of billets inside of the furnace in case of shut down. The general trend today is toward a more mechanical furnace even though the investment involved is considerably more. One plant during the past year has installed a walking beam furnace for this work and in all probability other plants, as they purchase new equipment, will lean toward mechanical conveyors of one description or another.

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ANY of the billet furnace types discussed under tube mills except roll-down furnaces could find a place in the wire mill, bearing in mind, however, that as a general rule a wire bar is square and is somewhat longer than the billets used for fabrication of tubing.

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Break-Down Annealing

AFTER being hot rolled the material is coiled and transported to the wire machines where it is drawn through dies for further reduction.

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DURING the intermediate or break down reductions, the wire is always handled in coils and the annealing is generally done in batch type pan furnaces. A number of plants, however, have installed continuous furnaces for this work and the general trend is toward continuous operation where the capacity of the mill permits. Control of temperature and atmosphere is becoming more important and gas is being more widely used.

Finish Annealing

WIRE may be finished in the form of coils or it may be placed on spools or reels. A variety of furnaces is used for finish annealing. Of these, the most common would include furnaces of the Kenworthy type, indirect-heated retort furnaces, tray pusher furnaces, chain conveyor furnaces, and belt conveyor furnaces. While a great deal of wire is finish annealed in direct-fired furnaces, still an attempt has been made to control the atmosphere with this class of work to a greater extent than with any other non-ferrous product. Since wire, particularly, in the smaller gauges, does not lend itself to pickling conveniently, a bright anneal is almost a necessity. In the past few years, because of their flexibility, rapid heating characteristics, adaptability to atmosphere control, and ability to produce a uniform metallurgy, bell type furnaces have received wider acceptance here than in any other branch of the non-ferrous industry.

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FINISH annealing furnaces for wire present a problem in that a large percentage of the wire is finished on spools or reels and, as a result, the loads are fairly dense. The problem is further complicated because of a wide variation in the size of the individual spools. The temperatures must be controlled very accurately to prevent over annealing of the outer layers and under annealing of the inner. Improper application of atmosphere and improper control of temperature may result in the individual successive layers sticking together with the result that the wire, where this difficulty is encountered, becomes scrap. Sticking is generally more troublesome where light gauges are being processed.

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A CERTAIN amount of wire is annealed in strand type furnaces where the wire is passed through either a direct-fired chamber or through tubes containing a protective atmosphere. Such furnaces produce a very high quality of wire but the number of installa-

tions has been relatively small because the physical size of the equipment required for a given capacity is far larger than for the other methods. Recently, one manufacturer has developed a method for annealing wire in strands by passing it directly through a gas flame. There is an insufficient amount of information available in connection with this process to state at this time whether or not it is commercially practical. Success of the method depends upon a close regulation of the speed of the wire as it passes through the flame. This, in turn, demands that the reeling mechanism be almost a precision machine. It is impossible to say just how wide an acceptance the process will receive because the cost of the reeling mechanism becomes quite high and also because at the present time the fuel consumption may run from 75% to 100% more than is required by other methods.

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IN general, we may say that any finish anneal on copper or copper alloy wire should utilize gas or at least a source of heat equally as susceptible to proper temperature and atmosphere control as gas.

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Rod Mills

Billet Heating

FOR all practical purposes the operations in a rod mill very closely approach the operations already described for the wire mill. The raw material comes to the rod mill in the form of either round or square bars. These may be hot rolled into rod or they may be extruded into rod or shapes. The types of furnaces used for heating the bars would be the same as discussed under wire mills and need no further discussion at this time.

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Break-Down Annealing

SIMILARLY, the annealing operations in the rod would be almost identical to those used in the wire mill during the breakdown period. Rod is generally annealed in bulk and the most widely used furnaces would consist of pan type annealers.

Relief Annealing

THERE is one operation which is encountered in the rod mill more than in any other branch of the non-ferrous industry. This consists of relief annealing which is really an ageing operation or low temperature anneal carried on at temperatures in the neighborhood of 600° F. This operation is conducted to prevent season cracking of the material after it has been in storage or used for a period of weeks or months. The operation is generally carried on in a convection type furnace either continuous or batch. The majority of the relief annealing furnaces to date have been heated with direct-fired gas air heaters.

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Fabricating Plants

IN general the operations encountered during the fabrication of non-ferrous metals and alloys into the ultimate product consist of annealing after cold working, and annealing for further working, and hot forging.

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THERE are too many ramifications to the fabrication of these materials to permit at this time an exhaustive discussion of the types of operations and of the furnaces utilized. In general, we may say that the present trend is toward the use of continuous heat-treating equipment. Where materials originally were annealed in large batches in periodic furnaces, today the more progressive plants are installing continuous furnaces in order to more nearly approach individual treatment of each part during the process of manufacture. as the demands of industry, as a whole, have been becoming more critical, it has been necessary for these plants to improve the control over their product in each step of its manufacture. Gas has, therefore, found a wide field of application in the fabricating plants.

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A GREAT many of the non-ferrous metals and alloys, containing two-thirds copper to all copper, are made into hot forgings. This operation at present is limited to relatively small forgings, small in comparison to those encountered in steel forgings. The process consists primarily of heating small slugs, generally cylindrical in shape, to the hot-working temperature of the particular alloy and pressing it into shape between dies. None of the furnaces required for non-ferrous forging are particularly large; a furnace having 1,000 lb. per hour capacity being considered a rather large production unit. Most of this work is done in either batch type furnaces where the slugs are charged directly upon the hearth or in small continuous furnaces where the work is conveyed through the furnace on pans which are either pushed mechanically or by hand. Working temperatures will run from 1,200° up to 1,800°, depending upon the alloy being worked. In the case of aluminum forgings, of which a great many are being made today, temperatures will run in the vicinity of 800° to 900° and most of the furnaces are heated by convection since the temperature control is very critical in the treatment of aluminum and its alloys.

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MANY of the older forging furnaces are heated with oil but most of the recent installations have been gas-fired because of the realization on the part of the manufacturers that a close control of atmosphere enables them to obtain a better finished product.

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Better Scales Through Better Springs

By J. W. Rockefeller, Jr.,
Consulting Engineer,
New York, N. Y.

A method of calculating helical springs with a constant mean diameter of coil and for the calculation of conical or barrel shaped springs. ✦ ✦ ✦

UNTIL recently, all scale springs were manufactured of high carbon or alloy steels. The process of manufacture depended largely upon the accuracy required in the scale itself. In very cheap scales not subject to tests by state sealers the cheapest obtainable springs might be used, while in other scales similar in design and outward appearance springs costing ten times as much would be employed, resulting in a better product albeit a considerably more expensive one. The conscience of the scale builder, in such cases dictated the manufacturing process of the spring.

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FOR higher grade springs, those used in most computing scales and some of the better made scales of other types, the process of manufacture aimed to result in small hysteresis and, so far as possible, freedom from drift and straight line load-deflection characteristics. No attempt was made to produce a spring which would maintain a constant elasticity in spite of temperature changes since the effect of temperature on the modulus of elasticity of steel, brass and other spring materials was known to be an inherent property of the metal itself. The scale manufacturer, like the watch manufacturer contented himself with temperature compensating devices which would counteract the effect of thermal changes upon the springs. An attempt was made to place the temperature compensating devices near the springs, although in some cases the design of the scale prevented this.

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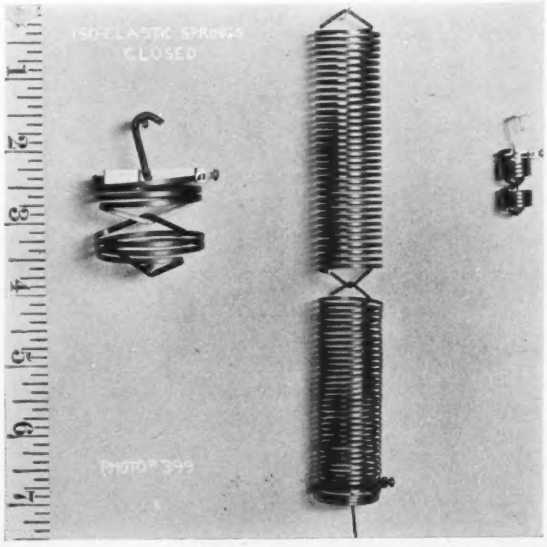


Figure 1. Iso-elastic helical scale and instrument springs. These springs are constant modulus and possess straight line load-deflection. Courtesy of John Chatillon & Sons. ✦ ✦ ✦

IN the early part of the century, Guilliaum, in France produced an alloy elinvar, of approximately 36% nickel, 8% chromium and the balance steel, the modulus elasticity of which remained constant in spite of temperature fluctuations. Using elinvar as a starting point, metallurgists busied themselves with adding other elements to the original alloy in order to increase its elastic limit and produce a material which could be used in scales and other precision instruments in place of steel springs. Just about 5 years ago, in this country a modified elinvar was produced, which not only met the requirements for thermal stability but also in the form of springs possessed a smaller hysteresis loop and better drift free properties than any metal previously used. Since that time springs of this material have been used in railway signaling devices, gravity meters, pressure gauges and numerous other applications. Because of the heretofore unattainable properties possessed by such springs, a complete revision of views regarding the applicability of springs in engineering has resulted, bringing with it marked and in many cases radical changes in the field of instrumental design. They have taken the place of steel springs in 90%

of the more expensive computing scales. In railway track scales and testing machines, they have replaced in many instances the earlier pendulum, cam, and steel tape. While its chief applications has been in the form of a twin spring especially designed for computing scales, it has also been used in many other forms.

✦ ✦ ✦

IN computing scale construction twin springs of the general type shown in figure 1 are used in pairs. Research has revealed that in this application multiple spring installations show marked improvement over single spring installations not only from the point of view of uniform stress distribution but also in maintaining accuracy under varying degrees of temperature.

✦ ✦ ✦

IN some states, the regulations which compel coin operated scales to meet certain tolerances of accuracy are resulting in the adoption of constant modulus springs. Such weighing machines are used chiefly out of doors and are subject to temperature variations of as much as 100 degrees fahrenheit. Under these conditions a scale equipped with steel springs and no temperature compensating devices can register inaccuracies of as much as 6 pounds due to temperature changes alone.

✦ ✦ ✦

SO far as design and manufacturing methods go there is little in common between the newer constant modulus springs and the older type steel scale springs. While it was customary to make the earlier computing scale springs of annealed wire hardened after coiling thereby eliminating initial tension between coils, the newer spring is made of pre-tempered material with a controlled initial tension between coils. It is necessary, of course, for the manufacturer to know how much tare-weight in the form of platform, levers, etc., will be placed upon the springs since this tare-load is depended upon to remove all initial tension from between adjacent coils and to result in a straight line load-deflection characteristic from point of zero load to capacity.

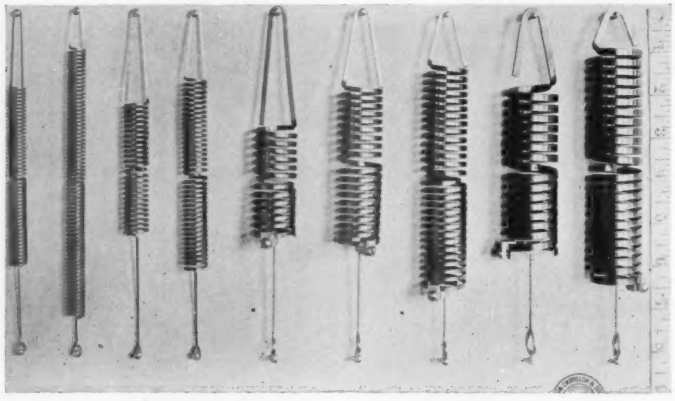


Figure 2. Set of interchangeable Iso-elastic springs made for a Testing Machine. Rates vary from 1/10 lb. per inch to 2½ lbs. per inch deflection. Hook length under tare is the same for all springs. Courtesy of John Chatillon & Sons. ✦ ✦ ✦ ✦ ✦

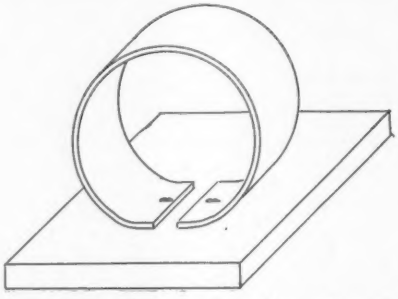


Figure 3. Circular constant modulus load measuring spring. ✦ ✦ ✦

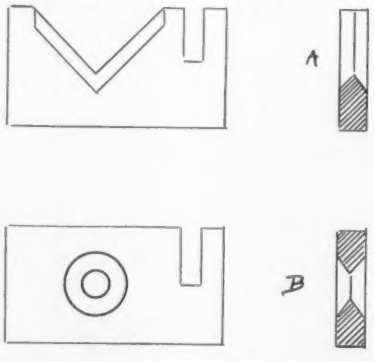


Figure 4. Knife edge calibrators used on scale springs. A—V type. B—Round hole type. ✦

✦ ✦ ✦

THE newer spring used for scales is coiled of a patented rectangular section with rounded ends, resulting in a straight line load-deflection curve or one which can be controlled to suit the needs of the individual scale design.

✦ ✦ ✦

IN the case of constant modulus springs for instruments other than scales, various sections of wire are used depending upon the individual application. Round wire springs with open coils are used in connection with bellows for indicating and controlling pressure instruments, this type of spring is double action being used in both extension and compression. In some cases in which it has been necessary to conserve space, rectangular wire has been coiled on edge. An interesting application of the newer spring material is a circle type spring shown in figure 3. This spring was used to make very fine measurements and displaced a spring of the cantilever type due to the advantage it possessed in deflecting in a plumb line at the point of application of load.

✦ ✦ ✦

Design of Scale Springs

IN general, the rules for design of constant modulus springs are the same as those for other springs.

✦ ✦ ✦

WHILE most helical spring formulas give spring deflection in terms of number of coils, it is often time saving to use the following formula which uses the active solid height in the coil.

$$\text{deflection} = \frac{8 \times \text{s.h.} \times D^3 \times P}{d^5 \times G}$$

in which

s.h. = solid height in coil in inches.
D = Coil diameter in inches.
P = applied load in lbs.
d = diameter of wire in inches.
G = Modulus of elasticity = #psi.

✦ ✦ ✦

FOR coils with a low $\frac{D}{d}$ ratio Wahls correction constants should be applied.

✦ ✦ ✦

CHART II, based upon the above formula and incorporating Wahls correction constants can be used for helical springs of round wire, of material having a torsional modulus of 9,000,000, the modulus of monel metal and constant modulus alloys.

✦ ✦ ✦

THE Chart assumes no initial tension between coils in an extension spring. Where such initial tension exists it will be necessary to subtract the initial tension from the total imposed load in calculating deflection. In calculating stress, however, the total imposed load of course must be used.

✦ ✦ ✦

Use of Chart II

CHART II is used to determine first the static deflection and second and fibre stress in any spring under a given static load. This chart may be used for springs made of any round wire the modulus of elasticity of which is 9,000,000 psi.

✦ ✦ ✦

FOUR factors are represented on chart II.

1. The horizontal lines indicating the mean diameter of the coil in inches (D), [that is the outside diameter of the coil less the diameter of the wire (O.D.-d)].

2. The vertical lines show the deflection per solid inch of coil under a static load of 100 pounds (f).

3. The heavy oblique lines represent the fibre stress in pounds per square inch in the material under a load of 100 pounds.

4. The light oblique lines represent the diameter of the wire from which the spring is coiled (d), in inches.

The light oblique lines correspond to the Washburn and Moen Gage sizes for circular section wire.

✦ ✦ ✦

THE use of the chart may be best illustrated by working out a numerical example. Suppose that the problem is to determine the deflection and fibre stress in an extension spring when a load of 30 pounds is imposed on it. The solid length of the coil being 5", the mean diameter of the coil 1.00" and the wire #10 Washburn and Moen or .135"; the spring to be made of material having a torsional modulus of 9,000,000 pounds per sq. in.

✦ ✦ ✦

FINDING on the chart, the intersection of D = 1.00" and d = .135, it will be seen that the stretch per inch of solid height (f) is 2.00 inches under load of 100 pounds. The value obtained from the chart is the deflection per one inch of solid height under a load of 100 pounds. In order to obtain the actual deflection under any given load for any solid height it is apparent that it will be necessary to multiply the figure obtained from the chart by the solid height of the spring in inches; to divide by 100 pounds and multiply by the actual load imposed upon the spring. The proper cancellations in the fraction resulting will give us the following fraction by which the result obtained on the chart must be multiplied.

$$\frac{\text{Solid height x load}}{100}$$

✦ ✦ ✦

SINCE the spring has a solid height of 5" and only 30 pounds is to be imposed upon it, the spring total deflection will be as follows:

$$\frac{2.00 \times 5 \times 30}{100} = 3.''00$$

✦ ✦ ✦

THE fibre stress obtained from the chart is the fibre stress in the material under a load of 100 pounds and in obtaining the actual stress in the material it is simply necessary to multiply the fibre stress obtained from the chart by the actual load imposed upon the

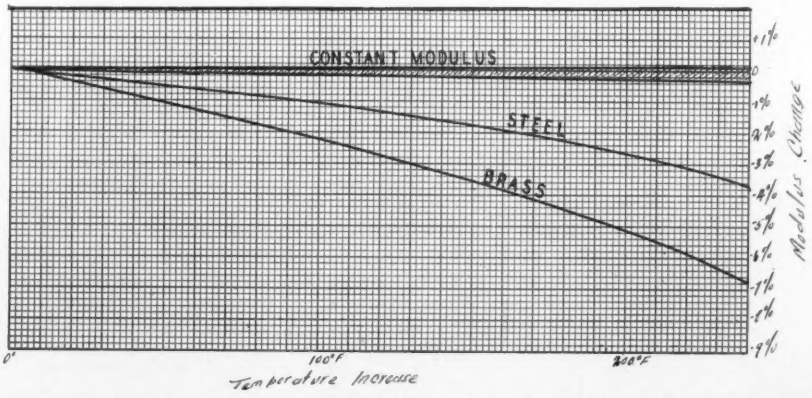


Chart 1. Temperature effect on the elasticity of Brass, Steel, and constant modulus alloys. The last named generally fall within the shaded area shown, exhibiting essentially constant modulus over the temperature range shown. ✦ ✦ ✦ ✦ ✦ ✦ ✦

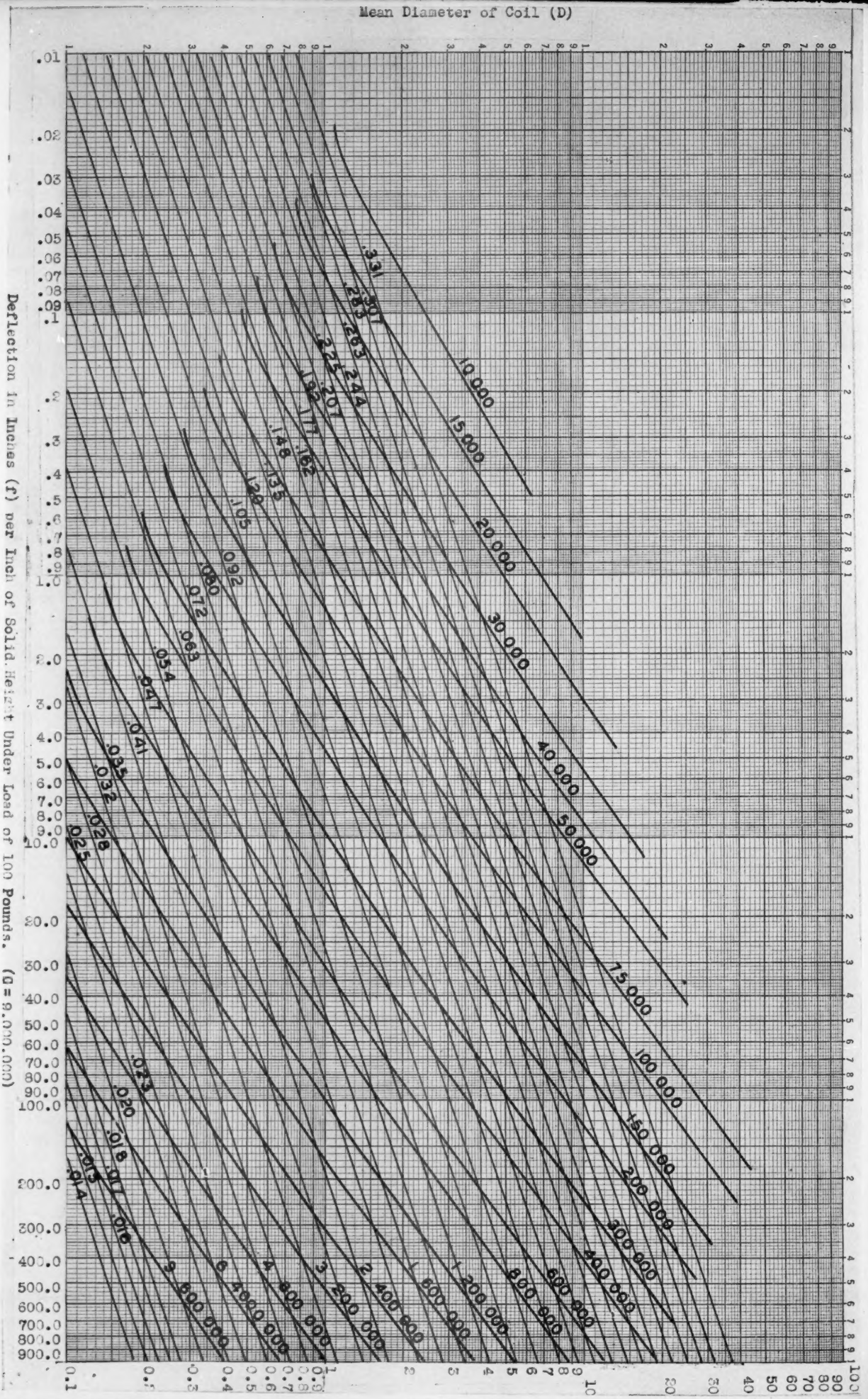


Chart 2. Chart for designing springs of material which has a torsional modulus of 9,000,000 p. s. i.

spring and to divide by 100 or to multiply by, $\frac{\text{weight in pounds,}}{100}$.

✦ ✦ ✦

THE fibre stress in the spring calculated above for a 30 pound weight would be

$$90{,}000 \times \frac{30}{100} = 27{,}000 \text{ Ps.i}$$

✦ ✦ ✦

IN all the above we have considered only helical springs with a constant mean diameter of coil. The charts, however, can be used for the calculation of conical or barrel-shaped springs, by substituting for D in the chart the following value

$$D = \sqrt[3]{\frac{(D_2^2 + D_1^2)\ (D_2 + D_1)}{4}}$$

where D_2 is the greatest and D_1 the smallest mean diameter of coil. This assumes that all coils are active under the load and that the load deflection diagram of the spring is a straight line. This will be true of compression springs up to a point where the coils start to close, but in conical compression springs in which some of the coils close before others, the formula will not hold after reaching the point at which the coils start to close.

TABLE OF THIRD AND FIFTH POWERS OF SPRING-WIRE DIAMETERS

W & M Gage	Diameter d	d^3	d^5
00	0.331	0.0363	0.00400
0	0.307	0.0289	0.00270
1	0.283	0.0227	0.00182
2	0.263	0.0182	0.00126
3	0.244	0.0145	0.000865
4	0.225	0.0114	0.000578
5	0.207	0.00887	0.000380
6	0.192	0.00708	0.000261
7	0.177	0.00555	0.000174
8	0.162	0.00425	0.000112
9	0.148	0.00324	0.0000710
10	0.135	0.00246	0.0000449
11	0.120	0.00173	0.0000249
12	0.105	0.00116	0.0000128
13	0.092	0.000779	0.00000659
14	0.080	0.000512	0.00000328
15	0.072	0.000373	0.00000193
16	0.063	0.000250	0.000000992
17	0.054	0.000157	0.000000459
18	0.047	0.000104	0.000000229
19	0.041	0.0000689	0.000000116
20	0.035	0.0000429	0.0000000525
21	0.032	0.0000328	0.0000000336
22	0.028	0.0000220	0.0000000172
23	0.025	0.0000156	0.00000000977
24	0.023	0.0000122	0.00000000644
25	0.020	0.00000800	0.00000000320
26	0.018	0.00000583	0.00000000189
27	0.017	0.00000491	0.00000000142
28	0.016	0.00000410	0.00000000105
29	0.015	0.00000337	0.000000000759
30	0.014	0.00000274	0.000000000538

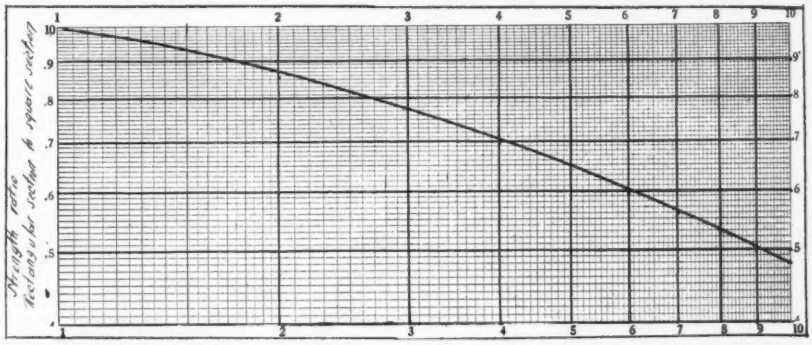


Chart 3. How a change in section ratio affects the strength of a helical spring. Rectangular section wires, coiled flat bear a strength ratio to a square section of the same area as indicated by this chart.

Charles R. Ellicott

CHARLES RAYMOND ELLICOTT, general manager of the Cambria plant of the Bethlehem Steel Corporation since 1936, died in Union Memorial Hospital, Baltimore, August 22nd at the age of 54. He had been a patient since Thursday but had been receiving treatment at the hospital since August 9.

✦ ✦ ✦

MR. ELLICOTT was born in Easton, Pa., August 15, 1885, a son of John E. Ellicott, who survives him and the late Fannie Ellicott. He attended the Easton public schools and entered Lafayette College, where he received a Bachelor of Science in chemistry in 1908. The same year he was married to Hazel P. Conety of Bucks County.

✦ ✦ ✦

IN JULY of 1908 Mr. Ellicott secured a position as chemist in the laboratory of the Bethlehem, Pa., plant of Bethlehem Steel Company. In February, 1909 due to a restriction of plant operations, Mr. Ellicott's position as chemist was terminated and he went to work a short time later as a laborer in the open-hearth department, starting his career from the bottom.

✦ ✦ ✦

HE WAS advanced to superintendent of the No. 1 open hearth furnace department at Bethlehem in January, 1913, marking the first of a series of important advances. In December, 1915, he was made superintendent of No. 1 and three hearths and in September, 1917, under a war-time plant reorganization, he was advanced to the position of superintendent of hot metal division, embracing the blast furnaces, open hearths, and tool steel and merchant bar mills.

✦ ✦ ✦

MR. ELLICOTT was appointed superintendent of furnaces

(*Please turn to Page 485*)

Chart 2. Chart for designing springs of material which has a torsional modulus of 9,000,000 p. s. i.

The Manufacture of Helical Spring Washers

By C. C. Washer,
Vice President,
Philadelphia Steel & Wire Corp., Philadelphia, Pa.

Helical spring washers requiring rigid exactness in manufacturing are among the leading products of this company which also produces rivet wire and high carbon cold rolled strip.

IF one were asked to compile a list embodying the various mechanical devices employed in the manufacture of an automobile, motor truck or farm tractor, it is quite likely that the Helical Spring Washer or "Lock" Washer as it is sometimes erroneously called, would be omitted altogether or else relegated to a very minor position. Yet it fulfills a very important function in maintaining bolted assemblies, and without it the machinery which we regard today as a very essential part of our daily lives would prove entirely incapable of meeting the demands we place upon it. When frictional wear of contacting surfaces, stretch of bolt, breaking down of scale, paint, etc. take place, the Spring Washer is ever on guard, serving as a tension member and compensator. It is vital therefore that it be made of the very best material possible to obtain for the purpose.

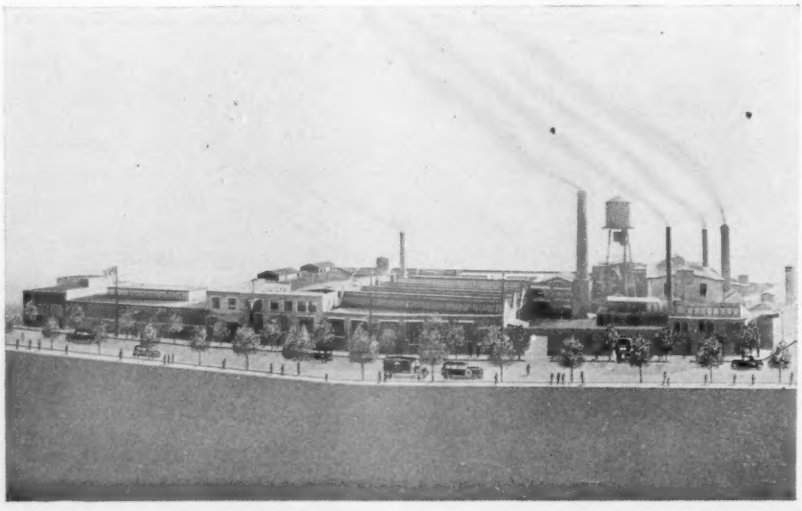
✦ ✦ ✦

Raw Material

THE first essential in the production of Spring Washers is a steel which can be fabricated and heat-treated to fulfill the qualifications required in their application. Such a steel must be metallurgically sound, properly balanced in the essential chemical constituents, and of inherent grain size which will allow for the maximum in physical properties after proper heat-treatment.

✦ ✦ ✦

WE have selected after comprehensive trials, a high carbon basic open hearth steel rod of fine grain size (5/8 McQuaid-Ehn). These rods, furnished to us in coils, approximate a round as closely as possible, and they are finished at the hot mill at a temperature somewhat higher than normal to facilitate subsequent cold drawing operations. Check analyses are made of each heat received, and the report accompanies the rods through their processing and final heat-treatment. Carefully controlled cleaning, sulling and liming of the rod is essential to successful cold drawing. Speeds and percentage of drafting must be held within limits which experience has proven safe in the avoidance of harmful effects from overdrafting to wire of finished Keystone shape for Spring Washer fabrication. Complete spheroidization treatments at regular intervals during the drawing of the wire are also very essential. Decarburization as well as excessive grain growth must be prevented during these important softening treatments. We have found the best temperature for spheroidize annealing to be just below the lower critical, about 1280-1310 degrees F.



The plant of the Philadelphia Steel & Wire Co. ✦ ✦ ✦ ✦

✦ ✦ ✦

Fabrication

THE finished Keystone shape wire is coiled into spring washer form, and each convolution severed on specially built automatic machines. The narrow edge of the Keystone is adjacent to the arbor, and in the coiling operation the "stretching" of the wire from its mean diam-

eter toward its heavy side and contraction toward its lighter side, results in a finished washer having parallel faces.

✦ ✦ ✦

Heat Treatment

TO obtain the ultimate from the steel applied in the production of the washers, it is necessary to subject them to the particular heat-treating cycle best suited to the analysis. The heating period and temperature for hardening must be of a sufficient degree and duration to insure complete solubility of the hardening elements without permitting excessive grain growth to take place. The furnace atmosphere must be of a sufficiently reducing quality to prevent decarburization at the temperature involved. We have found the continuous type rotary retort furnace with automatic temperature control very desirable for insuring the most uniform time temperature cycle for quenching. With this type of furnace, there are twelve burners for propane gas on each side, their locations being such that proper heat input can be governed throughout the length of the retort. An added feature is that of controlling the burners at the intake and discharge ends separately, making it possible to bring the work up to heat in the minimum period of time to suit conditions and maintaining it through the proper soaking period before quenching. Washers are hopper fed to the retort, and the feeding mechanism is constructed to control the volume of work entering the furnace. As it revolves, it carries the Spring Washers gradually through the proper heat cycle to the discharge end. They then drop through an enclosed chute into a rotating quench drum submerged in oil without coming into contact with the air.

✦ ✦ ✦

OUR experience has proven that care must be exercised in the selection of the quenching medium and its temperature to insure proper dissipation of heat, in order that the work receives the desired quench hardness without danger of developing quench cracks. This can be more fully appreciated when it is considered that the range of Spring Washer sizes processed runs from those weighing only a few ounces to others weighing several hundred pounds per thousand. Consequently, it is necessary that heating and quenching equipment be selected of a capacity best suited to the work to be processed.

✦ ✦ ✦

FRACTURE and hardness tests are made at close intervals to confirm furnace accuracy.

✦ ✦ ✦

ALL oil remaining on the work from the quench is removed in an automatic washing and drying machine prior to tempering.

✦ ✦ ✦

THE temper or draw treatment constitutes the final stage in the heat-treating process and is best accomplished in a furnace with circulating atmosphere, under automatic temperature control. With such equipment it has been determined that variations in temperature throughout the charge can be held within 5 degrees Fahrenheit.

✦ ✦ ✦

FINAL inspection involves Rockwell and fracture tests for ductility from each furnace load.

✦ ✦ ✦

IN addition to manufacturing Spring Washers, our company operates a rolling mill in Philadelphia in which we produce Basic Open Hearth and High Carbon Cold Rolled Strip Steel in all tempers, edges and shapes. However, we are equipped with high speed mills for tonnage production. Our range of sizes roughly is from .005″ to 5/16″ in thickness, and in widths ⅛″ to 6½″. We are equipped to furnish Cold Rolled Strip in Tinned and Galvanized finish, also lacquered or enameled on one side or both.

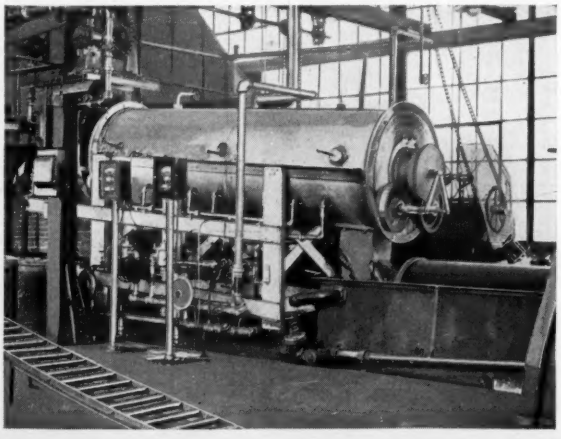
✦ ✦ ✦

WE also operate a cold drawing mill for the production of steel wire in areas from 1/32″ square or round to and including ⅜″ square or round. It is adapted to the production of special shapes within the above defined areas. We also draw considerable quantities of Rivet Wire.

✦ ✦ ✦

ANOTHER department of our business is devoted to the production of small stampings of high and low carbon strip steel, such as wire and cable clips used in the electrical and automotive i n -

(*Please turn to Page 485*)



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STATISTICS --- 2nd QUARTER --- 1939

PRODUCTION FOR SALE OF IRON AND STEEL PRODUCTS

AMERICAN IRON AND STEEL INSTITUTE
Capacity and Production for Sale of Iron and Steel Products

Second Quarter - 1939 (PERIOD)

		Number of companies	Items	Annual Capacity Gross tons	Production for Sale—Gross Tons: Current Quarter: Total	Current Quarter: Per cent of capacity	Current Quarter: Shipments: Export	Current Quarter: Shipments: To members of the industry for conversion into further finished products	To Date (6 Months 1939): Total	To Date: Per Cent of capacity	To Date: Shipments: Export	To Date: Shipments: To members of the industry for conversion into further finished products
STEEL PRODUCTS	Ingots, blooms, billets, slabs, sheet bars, etc.	31	1	xxxxxxx	481,763	xxx	14,490	342,205	1,099,838	xxx	32,962	734,850
	Heavy structural shapes	8	2	4,691,800	474,295	40.4	22,671	-	933,213	39.8	38,462	xxxxxxx
	Steel piling	3	3	234,300	33,330	56.9	2,374	-	61,753	52.7	3,292	xxxxxxx
	Plates—Sheared and Universal	19	4	5,828,310	504,795	34.6	70,096	4,490	1,007,908	34.6	109,957	7,045
	Skelp	7	5	xxxxxxx	98,431	xxx	1,696	73,565	186,316	xxx	2,411	140,454
	Rails—Standard (over 60 lbs.)	4	6	3,395,300	361,907	42.6	3,015	-	631,668	37.2	6,495	xxxxxxx
	Light (60 lbs. and under)	6	7	418,500	14,291	13.7	7,958	-	33,890	16.2	13,248	xxxxxxx
	All other (Incl. girder, guard, etc.)	2	8	105,000	10,224	38.9	415	-	14,113	26.9	1,367	xxxxxxx
	Splice bar and tie plates	14	9	1,290,550	140,620	43.6	1,268	-	237,080	36.7	2,683	xxxxxxx
	Bars—Merchant	34	10	xxxxxxx	594,803	xxx	22,194	57,554	1,266,361	xxx	40,057	128,744
	Concrete reinforcing—New billet	13	11	xxxxxxx	232,329	xxx	14,373	-	410,418	xxx	27,372	xxxxxxx
	Rerolling	19	12	xxxxxxx	43,152	xxx	1,871	-	74,463	xxx	4,536	xxxxxxx
	Cold finished—Carbon	18	13	xxxxxxx	101,860	xxx	815	-	215,658	xxx	2,338	xxxxxxx
	Alloy—Hot rolled	14	*14	xxxxxxx	116,440	xxx	4,885	10,653	268,955	xxx	10,548	22,603
	Cold finished	14	15	xxxxxxx	11,722	xxx	45	-	25,296	xxx	127	xxxxxxx
	Hoops and baling bands	4	16	xxxxxxx	15,534	xxx	161	-	27,549	xxx	344	xxxxxxx
	TOTAL BARS	55	17	11,550,720	1,115,840	38.6	44,344	68,207	2,288,700	39.6	85,322	151,347
	Tool steel bars (rolled and forged)	15	18	94,160	8,443	35.9	454	-	16,308	34.6	1,126	xxxxxxx
	Pipe and tube—B. W.	15	19	1,623,800	179,240	44.2	6,858	-	345,624	42.6	13,253	xxxxxxx
	L. W.	11	20	1,316,580	68,723	20.9	2,904	-	132,963	20.2	4,586	xxxxxxx
	Electric weld	4	21	615,000	52,856	34.4	2,405	-	81,819	26.6	3,555	xxxxxxx
	Seamless	15	22	2,968,900	285,963	38.3	17,209	-	582,799	39.3	33,223	xxxxxxx
	Conduit	6	23	153,670	14,267	37.1	398	-	27,534	35.8	846	xxxxxxx
	Mechanical Tubing	5	24	182,100	20,962	46.0	1,097	-	44,083	48.4	1,903	xxxxxxx
	Wire rods	19	25	xxxxxxx	133,342	xxx	9,141	44,166	278,354	xxx	13,640	92,185
	Wire—Drawn	38	26	1,970,195	261,269	53.0	14,465	2,985	515,558	52.3	28,117	6,811
	Nails and staples	19	27	1,080,760	121,450	44.9	7,135	-	268,754	49.7	12,007	xxxxxxx
	Barbed and twisted	16	28	428,075	50,391	47.1	12,705	-	100,138	46.8	20,548	xxxxxxx
	Woven wire fence	15	29	695,330	66,040	38.0	504	-	134,753	38.8	894	xxxxxxx
	Bale ties	11	30	110,680	15,935	57.6	35	-	24,219	43.8	56	xxxxxxx
	All other wire products	5	31	24,380	1,129	18.5	7	-	2,222	18.2	12	xxxxxxx
	Fence posts	12	32	134,700	15,429	45.8	308	-	28,052	41.7	594	xxxxxxx
	Black plate	12	33	462,815	76,601	66.2	1,809	25,460	156,908	67.8	2,833	55,457
	Tin plate—Hot rolled	10	34	1,540,360	122,544	31.8	21,905	-	244,739	31.8	39,541	xxxxxxx
	Cold reduced	10	35	1,925,200	433,364	90.1	40,055	-	733,068	76.2	66,036	xxxxxxx
	Sheets—Hot rolled	25	36	xxxxxxx	790,951	xxx	51,370	34,516	1,718,372	xxx	107,575	64,245
	Galvanized	16	37	xxxxxxx	255,268	xxx	25,855	-	530,320	xxx	46,813	xxxxxxx
	Cold rolled	18	38	xxxxxxx	356,642	xxx	17,365	5	785,119	xxx	55,084	xxxxxxx
	All other	16	39	xxxxxxx	89,229	xxx	2,324	-	188,951	xxx	6,656	xxxxxxx
	TOTAL SHEETS	27	40	11,315,065	1,492,090	52.7	97,114	34,521	3,222,742	57.0	216,128	64,245
	Strip—Hot rolled	24	41	3,209,300	210,287	26.2	6,609	27,771	467,140	29.1	13,876	62,985
	Cold rolled	36	42	1,160,910	109,693	37.8	1,528	-	246,369	42.4	4,191	xxxxxxx
	Wheels (car, rolled steel)	5	43	380,320	24,204	25.5	154	-	50,121	26.4	679	xxxxxxx
	Axles	5	44	425,900	10,223	9.6	2,122	-	19,444	9.1	2,924	xxxxxxx
	Track spikes	11	45	299,350	29,280	39.1	421	-	50,970	34.1	917	xxxxxxx
	All other	4	46	9,450	2,669	113.0	59	-	4,828	102.2	86	xxxxxxx
	TOTAL STEEL PRODUCTS	135	47	xxxxxxx	7,039,888	xxx	415,704	625,368	14,273,988	xxx	777,768	1,315,359
	Estimated total steel finishing capacity based on a yield from ingots of 70.0 %	-	48	48,514,000	xxxxxxx	52.9	xxxxx	xxxxxxx	xxxxxxx	53.4	xxxxxxx	xxxxxxx
	Pig iron, ferro manganese and spiegel	28	49	xxxxxxx	731,449	xxx	14,134	213,688	1,625,989	xxx	21,899	398,079
	Ingot moulds	4	50	xxxxxxx	50,938	xxx	329	-	118,405	xxx	329	xxxxxxx
IRON PRODUCTS	Bars	9	51	147,200	6,312	17.2	27	231	13,187	17.9	56	665
	Pipe and tubes	3	52	97,730	10,598	43.4	172	-	19,645	40.2	304	xxxxxxx
	All other	2	53	63,560	3,088	19.4	143	1,287	5,709	18.0	631	2,242
	TOTAL IRON PRODUCTS (ITEMS 51 to 53)	11	54	250,530	19,998	31.9	342	1,518	38,541	30.8	991	2,907

Total number of companies included - 156

Total steel products produced for sale, less shipments to members of the industry for conversion into further finished products Current quarter 6,416,520 G.T., 52.9 % of Finishing Capacity. To date 12,958,629 G.T., 53.4 % of Finishing Capacity.

The above tonnages represent 70.0% *of the ingots produced by companies whose products are included above*

THE WIRE ASSOCIATION 1939 CONVENTION
WILL BE HELD AT CHICAGO, ILL., OCTOBER 23-27, 1939
For Full Information Address —
RICHARD E. BROWN, Executive Secretary
Stamford Trust Co. Bldg. Stamford, Conn.

Exports and Imports of Wire

Exports of Iron and Steel Wire Products in June 1939 and June 1938
(In gross tons)

	JUNE 1939	MAY 1939	JUNE 1938
Wire rods	3,564	1,881	3,392
Strip steel	5,083	5,580	5,043
Plain, black or galvanized iron or steel wire	5,374	3,537	4,455
Barbed wire and woven wire fencing	5,139	3,857	3,300
Woven wire screen cloth	149	146	112
Wire rope	212	262	336
Insulated iron or steel wire and cable—see analysis below			
Other wire and manufactures	1,059	542	489
Wire Nails	2,035	1,528	1,547
Tacks	30	20	11
Other nails, including staples	482	305	414
Bolts, machine screws, nuts, rivets and washers	719	645	604
Total, these 11 classifications	23,846	18,303	19,703

Imports of Iron and Steel Wire Into the United States
(In gross tons)

Concrete Reinforcement bars	399	275	52
Hollow bar and drill steel	96	168	9
Wire rods	782	863	327
Barbed wire	1,883	1,829	866
Round iron and steel wire	128	116	49
Telephone and telegraph wire	.....	.....	.....
Flat wire and strip steel	261	313	154
Wire rope and strand	116	143	178
Other wire	125	132	160
Hoops and bands	1,849	2,061	1,806
Nails, tacks and staples	735	621	543
Bolts, nuts and rivets	3	17	21
Total, these 12 classifications	6,377	6,538	4,165

Exports of Insulated Wire and Cable, June 1939

	Foreign		To U. S. Possessions	
	Pounds	Dollars	Pounds	Dollars
Rubber covered wire	454,579	$103,726	67,052	$ 12,601
Weatherproof wire	304,055	40,819	66,925	10,488
Other insulated copper wire	630,419	115,924	96,567	17,489
Nickel-chrome electric resistance wire	49,239	71,978	75	92
Total, these 4 classifications	1,438,292	$332,447	230,619	$ 40,670

Exports

EXPORTS of iron and steel products (excluding scrap) at 189,968 gross tons in June were 28.5 percent higher than the May shipments of 147,760 tons. The shipments in June 1938 totaled 150,037 tons. June exports were valued at $13,789,887 as compared with the May valuation of $11,661,926 and the shipments amounting to $10,798,272 in June, 1938.

✦ ✦ ✦

JUNE imports of iron and steel products (excluding scrap) totaling 30,050 tons and valued at $1,487,504 were 24.3 percent higher in quantity and 5.8 percent higher in value than the 24,171 tons valued at $1,405,883 which were imported in May. These figures were also higher than the 15,573 tons valued at $1,035,536 which were imported in June, 1938.

Scrap Shipments Again Higher

SCRAP shipments in June at 398,888 tons valued at $5,692,273 compared favorably with the 384,881 tons valued at $5,638,013 exported in May. They were considerably higher than the 162,066 tons valued at $2,231,681 shipped in June, 1938. Shipments of 1,788,952 tons for the first six months of 1939 compared favorably with the 1,798,313 tons ($28,602,737) exported in the same period of 1938.

✦ ✦ ✦

Tin Plate High in Export Trade

TIN plate exports were high in June with the 25,718 tons being taken by the Netherlands, 3,851 tons; Sweden, 3,332 tons; Brazil, 3,100 tons; and Canada, 2,474 tons. Non-alloy "other" plates ranked closely with shipments of 25,507 tons going mainly to Sweden, 7,594 tons; the Netherlands, 4,891 tons; the Union of South Africa, 3,866 tons, and Mozambique, 2,660 tons. Non-alloy black steel sheets also ranked high—20,137 tons—with Canada, 3,920 tons; the United Kingdom, 2,770 tons, Sweden, 2,102 tons; Mexico, 1,594 tons, and Brazil, 1,363 tons the leading purchasers. French Indo-China, 3,301 tons; Canada, 1,191 tons; China, 1,063 tons; and Kwantung, 1,035 tons were the leading outlets for the 11,308 tons of non-alloy "other" steel bars, while the 10,030 tons of plain structural shapes were purchased for the most part by Canada, 4,053 tons and Sweden, 3,050 tons.

✦ ✦ ✦

Canada Leading Purchaser In June

CANADA was the chief market for June with a total of 21,854 tons, including 4,053 tons of plain structural shapes, 3,920 tons of non-alloy black steel sheets and 2,474 tons of tin plate. Second place went to Sweden where a trade of 19,276 tons was mainly of non-alloy "other" plate, 7,594 tons; tin plate, 3,332 tons; plain shapes, 3,050 tons; and pig iron, 2,950 tons. The Netherlands was third with 4,891 tons of non-alloy "other" plate, 3,851 tons of tin plate, and 1,048 tons of fabricated plates being the leading items in the 12,546-ton trade. Brazil, taking 10,695 tons, and China with 10,515 tons were fourth and fifth, re-respectively, with Mexico, 9,048 tons; Venezuela, 8,865 tons; the Philippine Islands, 7,533 tons, and the Union of South Africa, 7,363 tons among the leading countries.

✦ ✦ ✦

Imports Higher in June

JUNE imports of iron and steel products totaled 30,050 tons valued at $1,487,504 in comparison with 24,171 tons valued at $1,405,883 which were imported in May. In point of tonnage, spiegeleisen ranked first among classes of products with 5,790 tons of the 5,792-ton total coming from Canada. Structural shapes—with a total of 5,183 tons — ranked second with

(*Please turn to Page 482*)

Exports and Imports of Wire

(*Continued from Page 481*)

Belgium sending 3,542 tons and France sending 1,641 tons. Third place went to pig iron, with the 4,276 tons being supplied by British India, 2,263 tons; the Netherlands, 1,802 tons; and Canada, 211 tons.

✦ ✦ ✦

BELGIUM again headed the list of supplying countries by sending 9,074 tons of iron and steel products which included 3,542 tons of structural shapes, 1,332 tons of "other" hoops and bands, 1,203 tons of solid or hollow bars, and 1,032 tons of cotton ties. Canada ranked second with a total of 7,430 tons of which spiegeleisen, 5,790 tons; and rails and track material, 1,329 tons, were most important. The chief item of trade in the 3,482 tons received from France was 1,641 tons of structural shapes. The Netherlands ranked fourth,—the bulk of the 3,322-ton trade consisting of 1,802 tons of pig iron and 1,495 tons of ferromanganese.

CARD Clothing: 24,830 square feet, $38,024 (23,424 square feet, $35,115) which was furnished by the United Kingdom, 23,680 square feet, $35,277, Germany, 661 square feet and $1,879, and Belgium, 489 square feet, $868.

✦ ✦ ✦

WIRE Cloth and Screening: 19,806 square feet (29,451 square feet). 17,112 square feet came from the Netherlands and 2,694 square feet from Canada.

✦ ✦ ✦

WIRE Fencing and Netting: Galvanized before weaving: 199,950 square feet (none) which was furnished entirely by Belgium. **Galvanized after weaving:** 725,100 square feet (704,700 square feet) coming from Belgium, 691,950 square feet, and the United Kingdom, 33,150 square feet.

✦ ✦ ✦

FOURDRINIER: 17,589 square feet (19,583 square feet) of which 9,955 square feet came from France, 7,622 square feet from Sweden, and 12 square feet from Canada.

✦ ✦ ✦

WIRE Heddles: 670,000 pieces (367,000 pieces). 550,000 pieces were purchased from France, 110,000 pieces from Switzerland, and 10,000 pieces from Germany.

✦ ✦ ✦

Wood Screws

EXPORTS of iron and steel wood screws during June, 1939, totaled 9,101 gross valued at $2,081. Of this total, Colombia took 2,149 gross valued at $351; Finland, 1,390 gross valued at $603; Dominican Republic, 3,381 gross valued at $105; Canada, 1,019 gross valued at $202; Mexico, 815 gross valued at $192; Haiti, 380 gross valued at $52; Union of South Africa, 350 gross valued at $140; Nicaragua, 325 gross valued at $59.

✦ ✦ ✦

EXPORTS of brass wood screws during the same month totaled 3,794 gross valued at $2,003. Of

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CONTINUOUS IMPROVEMENT

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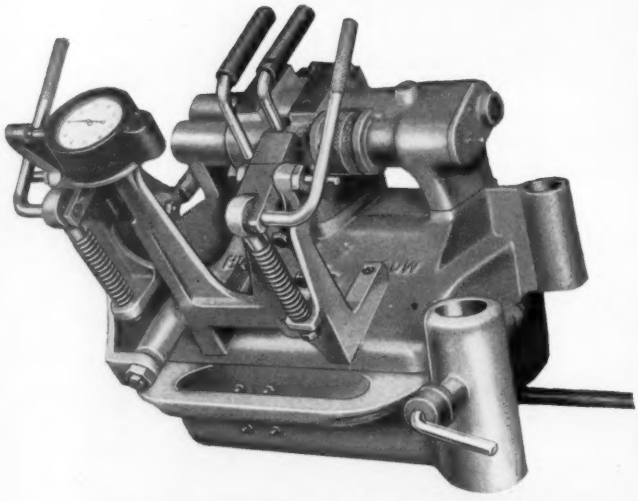

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Capacity #20 to #4 W & M gage high and low carbon wire.

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this total the Panama, Canal Zone took 1,204 gross valued at $560; Costa Rica, 670 gross valued at $279; Canada, 411 gross valued at $465; Cuba, 404 gross valued at $130; Finland, 287 gross valued at $151; Venezuela, 154 gross valued at $96.

✦ ✦ ✦

IMPORTS of wood screws during the same month totaled 30 gross valued at $27, supplied by Canada.

✦ ✦ ✦

'Round the World With the Wire Industry

THE shipment dates on wire for the domestic market have again been extended in certain cases to more than 26 weeks. On the export market 10 weeks is about the maximum quoted. The demand for wire and wire products, although still satisfactory for this season, is showing signs of the usual summer slack. In June, export turnovers were about 30% better than same time last year and July may show a similar result.

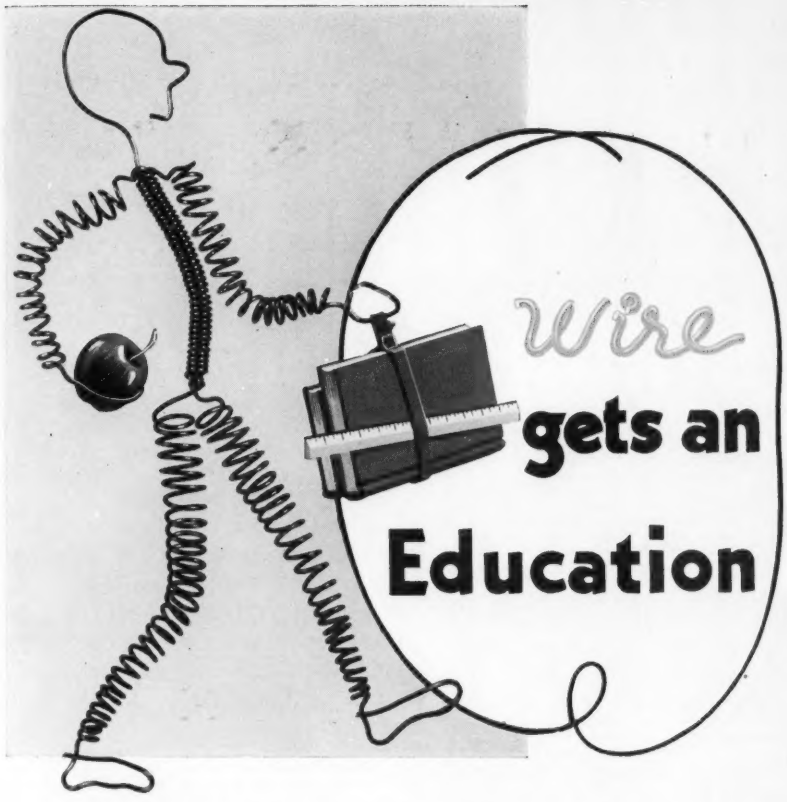
✦ ✦ ✦

THE restrictions for using fencing wire in cities will be maintained, although it was reported in error by some newspapers that the use of fencing wires were restricted. This would not apply to agriculture, but only to fencing of property in the cities.

✦ ✦ ✦

THE demand in the export market for wire and wire products continues satisfactory. For wire netting and steel wire largest numbers of orders have been received, barbed wire and fencing not so much in demand. July is usually the month of the greatest summer quietness, but this year it is different, turnovers being, compared with last year, between 40 and 60% better, although smaller than in May-June. The industry still has large orders from last spring to execute and shipment dates are extended. No change of prices has been noted during the past weeks. The reports that the IWECO may come to an agreement with the Swedish

(*Please turn to Page 484*)



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Bright . . . Tinned
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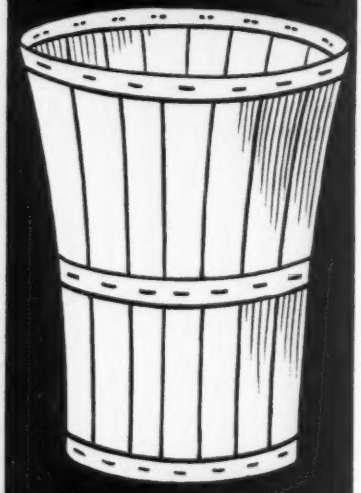

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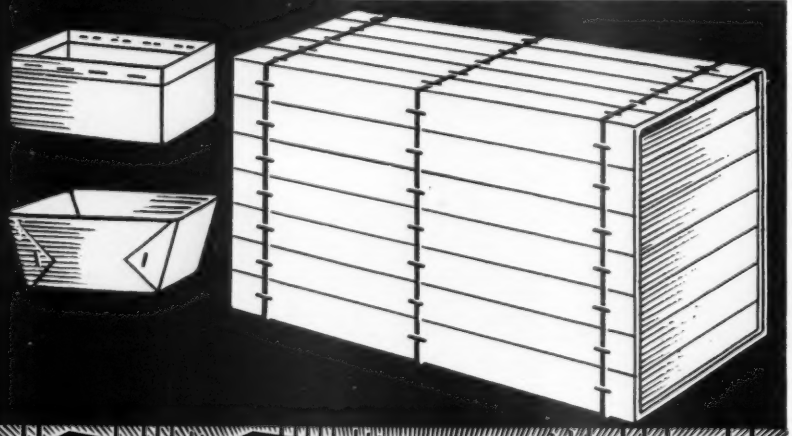

CONTINENTAL

STEEL SHEETS AND WIRE PRODUCTS

Wire: Bright Basic, Annealed, *Konik, Special Manufacturers, Galvanized, *Flame-Sealed

Wire Rods, Nails, Staples, Bale Ties, Barbed Wire; Fence — 15 Types; Gates and Fittings

Sheets: Black, Galvanized, Special Coated; Roofing and Siding—14 Styles

*Trade Mark Registered, U. S. Patent Office

'Round the World With the Wire Industry

(*Continued from Page 483*)

industry as regards cooperation on the export markets have not been borne out.

✦ ✦ ✦

THE new increase in French wire prices may have an influence upon the export market, especially as the French wire cartel appears to be rather weak. Due to the fact that on the domestic market in France not only the basis prices were increased by 12 frs. per 100 kks, which is 8% of the value, but also the extras, the French domestic buyers had almost entirely stopped purchases, expecting this increase and having bought before. The French industry may seek more export business and pressure of the industry on certain export markets has already been noted.

✦ ✦ ✦

THE export demand for rivets, bolts and nuts is satisfactory. In May and June Germany's exports were about 22% superior to those of May and June 1938. Prices are also better than last year, with few exceptions. For wire netting the demand is said not to correspond for the season on the domestic market, as usually at this time of the year the demand is declining. This year in the contrary the works are overstocked with orders, in spite of the perpetual expansion of all plants. The same applies to wire nails, the demand for which is beating all records, also for special nails. The demand for wire rods is very heavy, in the domestic as well as export markets. Business has not been hampered by the recent price advances of sh 5/-10/-, but on the contrary more orders have been placed.

✦ ✦ ✦

THE present production of wire rods in Germany (some 130,000 tons per month as compared with the average of 3107.000 tons in the whole of 1938 and 91.000 in 1937, 73.000 in 1936) is still considered insufficient to the demand and supplies have to be rationed to wire makers although export

supplies are only small and have been maintained unaltered for years at 4-5000 tons per month.

✦ ✦ ✦

NEGOTIATIONS with the Polish industry, in spite of the circumstance that Poland was represented at the last meeting of the IWECO at Liège, have not been successful. New propositions will be made at the next September meeting.

✦ ✦ ✦

The Manufacture of Helical Spring Washers

(*Continued from Page 477*)

dustries, and specially formed spring washers for various applications. Equipment in this department includes specially designed furnaces for the heat-treating of small high carbon steel stampings, and because of automatic temperature controls. we are able to guarantee very precise limits of hardness. All raw material used in these stampings is produced in our own mill.

✦ ✦ ✦

ALL buildings are located on railroad sidings, so that material handling costs are minimized both from the standpoint of inbound and outbound freight.

✦ ✦ ✦

Charles R. Ellicott

(*Continued from Page 475*)

and alloy mills in the Lehigh division in 1922 and was appointed assistant general manager of the Cambria plant in 1928, succeeding the late L. R. Custer as general manager upon Mr. Custer's death July 31, 1936.

✦ ✦ ✦

MOST notable in Mr. Ellicott's career were his handling of the mills during the Little Steel strike of 1937, a situation complicated by the closing of the mills upon executive orders of former Governor George H. Earle, and his restoration of the steel plants after Johnstown's thirty-million-dollar flood in 1936, at which time he was still assistant general manager.

✦ ✦ ✦

SURVIVING, besides his father, are his widow, a son, Charles R. Jr., of Sparrows Point, Md., and three brothers, Paul B., J. Clifford and Joseph E. Ellicott, all of Bethlehem.

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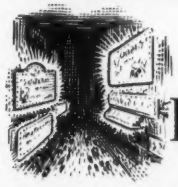

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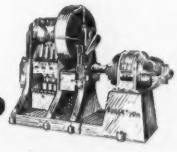

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A Review of Recent Wire Patents

No. 2,164,481, METHOD AND APPARATUS FOR MAKING WIRE FABRIC, Patented July 4, 1939 by James K. Watkins, Monessen, Pa., assignor to Pittsburgh Steel Company, Pittsburgh, Pa., a corporation of Pa.

More particularly the method and apparatus relates to the manufacture of wire fencing in which the wire pickets may be of dual length and alternate pickets may extend only over a part of the height of the fence. There are 15 claims.

Complete Descriptions and Drawings of Patents May Be Had for 25 cents. Address, Wire & Wire Products, 300 Main St., Stamford, Conn.

✦ ✦ ✦

No. 2,164,630, HIGH SPEED STRANDING OF WIRE ROPE MACHINE, Patented July 4, 1939 by Wm. E. Somerville, Coal City, Ill.

The cradles rotate in one direction and the machine at a different direction, with the rates of speed of rotation differing, so that the opposite twist or back turn will be taken out of the strands as they are being laid about the core.

✦ ✦ ✦

No. 2,164,904, INSULATED WIRE AND METHOD OF MAKING SAME, Patented July 4, 1939 by William E. Cook, West New Brighton, N. Y.

The assembly includes a conductor wire and an insulating cover therefor, embodying therein an inner stratum of an asphaltum compound in continuous contact with, and closely adherent to, the conductor wire, and an inclosing body of fibrous material having its inner part combined with the asphaltum compound stratum, the fibrous body being impregnated with an asphaltum compound, whereby the greatest density of the asphaltum compound will be in the stratum about the wire.

✦ ✦ ✦

No. 2,165,010, ANCHORAGE APPARATUS, Patented July 4, 1939 by Heyman Rosenberg, New York, N. Y.

A combination tap and threaded fastener is provided with full depth threads at one end, constituting a holding section, and a tap section at its entering end having cutting and compressing threads thereon of a diameter less than the diameter of the threads of holding section and greater than the root diameter of that section.

✦ ✦ ✦

No. 2,165,011, ANCHORAGE APPARATUS, Patented July 4, 1939 by Heyman Rosenberg, New York, N. Y.

In this form, which is related to the above, the tip only is tapered and provided with a longitudinal notch, with its leading wall being gradually inclined to the tops of the threads and the notch's trailing wall being abrupt.

✦ ✦ ✦

No. 2,165,056, METHOD FOR DRAWING SMALL DIAMETER WIRES, Patented July 4, 1939 by Philip R. Kalischer, Wilkinsburg, Pa., assignor to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pa.

The process is provided for drawing wire from tin, with the wire of small diameter. The first-drawn wire, as well as the die, are cooled and the wire again drawn.

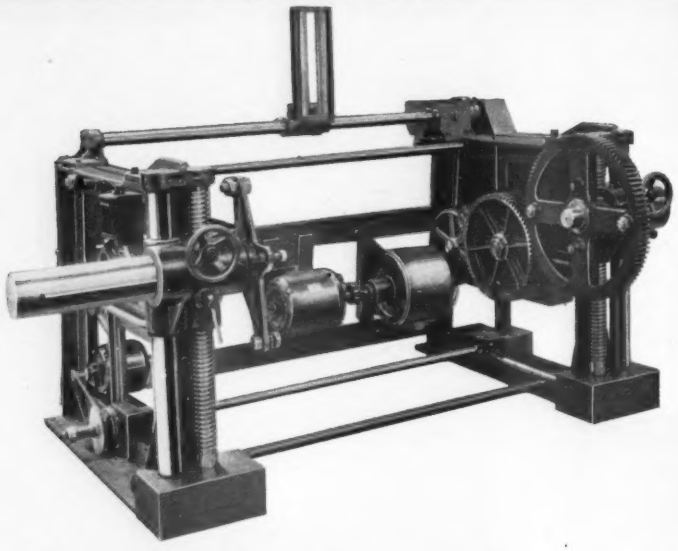
✦ ✦ ✦

No. 2,165,149, TAPPING SCREW AND METHOD OF FORMING SAME, Patented July 4, 1939 by Carl G. Olson, Chicago, Ill., assignor to Illinois Tool Works, Chicago, Ill., a corporation of Illinois.

Entering threads of this screw have serrated cutting edges.

✦ ✦ ✦

No. 2,165,424, APPARATUS FOR MAKING SCREW BLANKS, Patented July 11, 1939 by Joseph J. Tomalis, Providence, R. L., assignor to American



Syncro leads again . . .

with a vastly improved Cable Take-Up

The new Syncro Cable Take-Up Unit employs a specially designed magnetic slip clutch, which maintains uniform cable tension during the entire spooling of cable on standard capacity reels and it is designed so the cable tension can be adjusted while the unit is operating. Moreover, there is no wear on the magnetic slip clutch and no slip rings or moving electrical connections are required.

A motor driven mechanism raises or lowers the arbor centers, and a positive device constantly holds the driving gears in mesh so the arbor centers can be raised or lowered to suit the diameter of the reel while the Take-Up is operating.

The arbor centers are adjustable within reasonable limits to take various width reels.

The traverse is of the adjustable stroke, adjustable pitch type to accommodate different cable diameters and the stroke and pitch are readily changed while the unit is operating.

It will pay you to write for detailed information regarding the improved Syncro Cable Take-Up.

Syncro Machine Company

420 Lexington Avenue NEW YORK

Represented in Canada by — Canadian Elevator Equipment Co., Ltd., Toronto.

Screw Company, Providence, R. I., a corporation of Rhode Island.

This apparatus is of the two-blow type, the punches being held against rotation while in the holder and closely cooperate, one with the other.

✦ ✦ ✦

No. 2,165,425, METHOD OF MAKING RECESSED HEAD SCREWS, Patented July 11, 1939 by Joseph J. Tomalis, Providence, R. I., assignor to American Screw Company, Providence, R. I., a corporation of Rhode Island.

A head is provided, having a number of radial enlargements, then a recess, with radial grooves, is provided in the head, with the grooves being punched in the enlargements.

✦ ✦ ✦

No. 2,166,055, RESISTANCE WIRE OR THE LIKE, Patented July 11, 1939 by Carl Albert Henry Jahn, London, England, assignor to Johnson Matthey & Company Limited, Hatton Garden, London County, England.

The wire composes 60 to 80% platinum, from 10 to 30% palladium and from 2 to 15% of one of the hardening metals, rhodium and ruthenium.

✦ ✦ ✦

No. 2,166,087, WIRE CUTTING MACHINE, Patented July 11, 1939 by John G. Baumgartner, Aurora, Ill., assignor to National Brush Company, Aurora, Ill., a corporation of Illinois.

Electro-magnet guide means is provided for the wire, which will maintain the wire straight until cut, and will then be deenergized in order that the cut wire will drop out of the pathway of the next wire to be cut.

✦ ✦ ✦

No. 2,166,369, SOLID SCREW CUTTING DIE, Patented July 18, 1939 by Thorvald Petersen, Erie, Pa., assignor by mesne assignments, to Security-Peoples Trust Company, Erie, Pa., a corporation of Pennsylvania.

Chasers are permanently fixed to the die wall, the chasers being arranged in pairs, each pair comprising a cutting chaser with thread cutting teeth and a guide chaser having non-cutting guide teeth, the teeth of the chasers of each pair having their surfaces centered at a point offset from the center of the die toward the pair.

✦ ✦ ✦

No. 2,166,636, WIRE KNOTTING MACHINE, Patented July 18, 1939 by Samuel S. Marcus, Lewisboro, and Samuel Krakauer, New York, N. Y.

The machine is adapted to anchoring the free ends of coiled upholstery or furniture springs to the convolutions adjacent the ends.

✦ ✦ ✦

No. 2,166,796, INSULATED CONDUCTOR, Patented July 18, 1939 by Chester R. Colbree, Bridgeport, Conn., assignor to General Electric Company, a corporation of New York.

About the wire core is a rubber insulation, then a sheath of felted asbestos, next concentric wires readily movable upon the felted asbestos upon flexure of the concentric wires.

✦ ✦ ✦

No. 2,167,397, WATER-COOLED WIRE BLOCK, Patented July 25, 1939 by Carl E. Tideman, Worcester, Mass., assignor of one-half to Verner G. Anderson, Worcester, Mass.

The construction includes a wire block rotatable on a substantially vertical axis and having a rim about which wire is coiled, and a stationary ring-shaped pipe positioned inside the block above the level of the lowermost part of the substantially cylindrical portion of the rim about which the wire is coiled and having nozzles for directing cooling fluid against the inner surface of the rim throughout the entire circumference thereof.

✦ ✦ ✦

No. 2,167,558, SELF-TAPPING BOLT, Patented July 25, 1939 by Ralph H. Upson, Ann Arbor, Mich., assignor to The Lamson & Sessions Company, Cleveland, Ohio, a corporation of Ohio.

An unhardened head is provided, having a tapered hole with its entrance diameter larger than its mean diameter, the stem of the bolt having a tip diameter less than its mean major diameter.

✦ ✦ ✦

No. 2,167,559, SELF - TAPPING SCREW, Patented July 25, 1939 by Ralph H. Upson, Ann Arbor, Mich., assignor to The Lamson & Sessions Company, Cleveland, Ohio, a corporation of Ohio.

In this form, the thread roots be on a single conical surface, and the thread depth progressively diminishes toward the head throughout a substantial portion of the screw length.

✦ ✦ ✦

THE WATSON MACHINE COMPANY

ESTABLISHED 1845

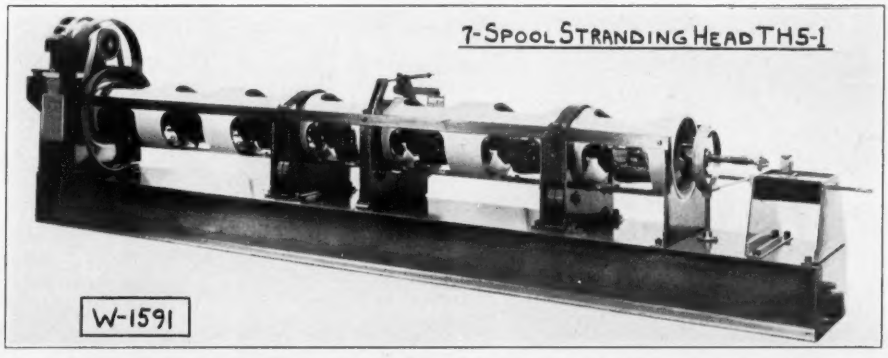
PATERSON, NEW JERSEY, U. S. A.

TUBULAR STRANDING MACHINES

Standard Sizes For From 5 to 1000 Pound Spools

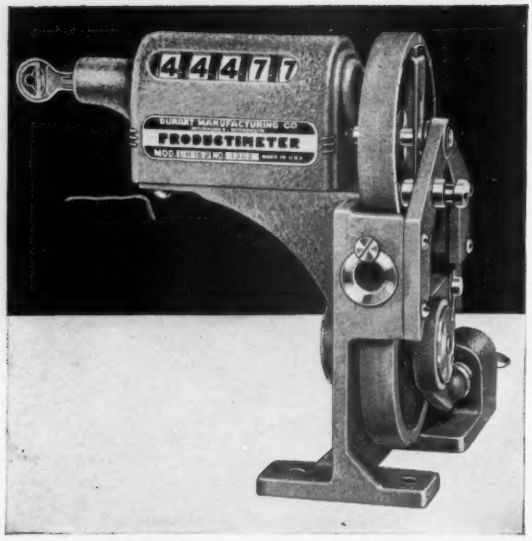
Silent Support Rolls—All Steel Rotor—Vee Belt Drive—Electric Stops

7 Second Brakes



ELECTRICAL WIRE, CABLE & WIRE ROPE MACHINERY

Printed Literature Available On Considerable Of The Equipment Used In These Fields—Inquiries Are Invited



Durant Wire Measuring Machines

•

Booth M304 National Metal Exposition

•

Chicago Oct. 23-27

If You Measure Off Wire or Cable

Don't fail to inspect our booth in the Metal Exposition where we will exhibit a complete series of wire measuring machines, setting new standards in fast, accurate, lineal measuring of any kind of wire, wire rope, or cable from .005" dia. up.

DURANT MFG. CO.

1916 N. Buffum St. Milwaukee, Wis.

176 Eddy Street Providence, R.I.

ARE YOU USING ONE OR BOTH

NORTON ABRASIVES ?

for Shaping, Grinding and Polishing Wire Drawing Dies?

CRYSTOLON ABRASIVE — you'll like the fast cutting action of this hard, sharp silicon carbide abrasive — made in Norton Company's own electric furnace plant under carefully controlled conditions.

NORBIDE ABRASIVE — another Norton electric furnace product — is showing great economy on cemented carbide dies for operations usually performed with diamond dust.

NORTON COMPANY, Worcester, Mass.

G-75

NORTON ABRASIVES

POSITION WANTED

25 years' experience drawing low and high brass wires, phosphor bronze, monel, nickel-silver, copper, etc. Last 12 years specializing fourdrinier wires. Experienced pot, bright or strand annealing tube furnaces. 20 years as supervisor of wire drawing plant. All necessary references furnished upon request. Address Box 310.

WIRE & WIRE PRODUCTS

L. Gerald Firth, President, American Carbide Alloys Corp.

L. GERALD FIRTH, president, Firth-Sterling Steel Co., McKeesport, Pa., has been elected president, American Carbide Alloys Corp., a newly acquired and wholly owned subsidiary of Firth-Sterling. G. A. Jacobs, of Firth-Sterling's Detroit office, has been made first vice president; W. H. Lolley, New York, second vice president; Clyde N. Gillespie, McKeesport, treasurer; H. R. Huemme, McKeesport, secretary; R. H. Hallagan, Detroit, assistant secretary and assistant treasurer, and George Knaepper, Detroit, chief engineer. Messrs. Lolley and Knaepper have been associated with the American Carbide corporation. Main office and works of the corporation will be in Detroit.

✦ ✦ ✦

E. H. Peirce, Superintendent Rod And Wire Department, Wheeling Steel Corp.

EDWIN H. Peirce has been appointed superintendent of the rod and wire department at the Portsmouth works of the Wheeling Steel Corporation.

✦ ✦ ✦

MR. PEIRCE was for 20 years associated with the American Steel & Wire Company at their New England plants, as chief metallurgist, superintendent of New Haven works, and later superintendent of the South Works at Worcester. Mr. Peirce brings to the Wheeling Steel Corporation a broad experience in the manufacture of rod, wire and wire specialities.

Machinery's Part in Future Social Progress

"TO provide even the standard of living of 1929 we have neither the mechanical equipment in place nor the skilled labor supply necessary," state business economists Allen W. Rucker and N. W. Pickering in an analysis of the theory of technological unemployment. The analysis has just been published in booklet form by Farrel-Birmingham Company, Inc., Ansonia, Conn., under the title "Machinery's Part in Future Social Progress."

✦ ✦ ✦

"THERE is," say the authors, "always sufficient shifting and displacement of labor due to technological change to lend some color to the theory of machine-caused unemployment; it is natural for individuals affected to conclude from their limited observations that the machine causes economic unemployment. Actually, displacement of labor at the point of machine use is more than counterbalanced by the addition of labor at the point of machine construction, transportation, installation, maintenance and replacement, as well as at the point of production of added buildings and power necessary. Thus the percentage of population employed continues to rise and would rise faster were restrictions upon industry removed or modified."

✦ ✦ ✦

THE authors point out that in 1880 only 5.46% of the population was gainfully employed; if that percentage prevailed in recent years, employment would have been less than it was by some one and one-half million jobs. Listing nine fallacies in the reasoning of the advocates of technological restriction, Messrs. Rucker and Pickering emphasize that in reality upwards of eight to ten man-years of labor in machine construction are required to provide a production tool for one man—and it is rare that the labor saved in production exceeds the labor expended in machine construction in a shorter space than two to three years. The authors reason that

(*Please turn to Page 490*)

***Bell-Mine Pulverized* LIME**

WARNER COMPANY Lime Bell Mine Products BELLEFONTE DIVISION

FOR WIRE DRAWING

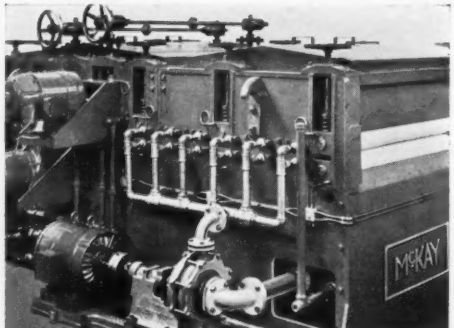
Because the pure limestone is deep mined 700 feet below surface at Bellefonte, is burned in large modern Rotary Kilns under constant engineering supervision, and the lime is check-tested by trained chemists in the Warner Laboratory at the plant

BELL-MINE LIME IS UNIFORM AND PURE

Warner Company

Bellefonte Division

Sales Offices: Pittsburgh, Philadelphia, Bellefonte, N. Y. City



Durimet for alkaline solutions

The Durimet (stainless steel) centrifugal pump used in the McKay Scrubber circulates the alkaline scrubbing liquor at the rate of 270 g.p.m.

Durimet, a special nickel-chromium-molybdenum corrosion-resisting alloy steel, will handle not only alkaline solutions but also acid solutions equally well. From Durimet is made standard finished equipment, such as pumps, valves, pipe fittings and castings, and also special equipment made to suit the customer's requirements.

There may be places in your plant where Durimet could be used advantageously for corrosion-resistance and long life. We shall be glad to discuss with you the application of Durimet to your use.

Let us help you with your corrosion problems.

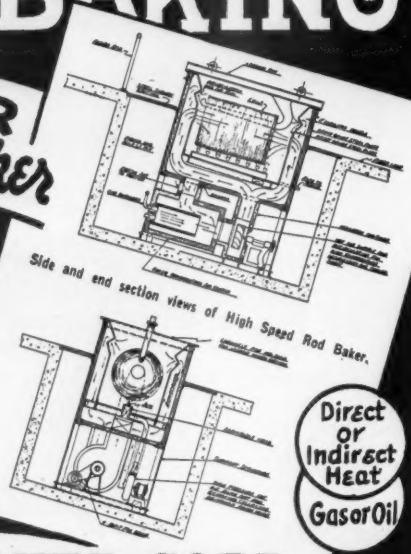
THE DURIRON COMPANY, Inc.

445 N. Findlay St. Dayton, Ohio

It will "show you something" in **ROD BAKING**

CARL-MAYER "Hi-Speed" Rod Baker

Patents Allowed and Patents Pending



Side and end section views of High Speed Rod Baker.

It is backed by 20 years' experience and a reputation for advanced engineering and dependability in industrial oven construction . . . Write for literature today.

Direct or Indirect Heat

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THE CARL-MAYER CORP.

ROD BAKERS ~ OVENS ~ AIR DRAW FURNACES

3030 EUCLID AVENUE ◇ CLEVELAND, OHIO

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See The Latest Spark Testing Equipment Which Is The Only American Made Equipment That Will Meet the New British Standard Specifications For Spark Testing.

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TRY SMIT SUPERIOR DIAMOND POWDER

FINEST Raw Material reduced to sharp cutting fragments under controlled conditions.

UNIFORM Sizes from #1 to #6 assured by our particle size analyzer.

DEPENDABLE Performance is the result of using the consistently uniform Smit Diamond Powder.

J. K. SMIT & SONS, INC.

157 Chambers Street, N. Y., N. Y.
968 Farmington Avenue, Hartford, Conn.
605 Law & Finance Building, Pittsburgh, Pa.

Machinery's Part in Future Social Progress

(*Continued from Page 489*)

the production of machinery is constantly creating a net increase in employment rather than a net reduction and the rising percentage of total population employed bears out that conclusion.

✦ ✦ ✦

THIS report on the economic contribution of machinery calls attention to the fundamental desires of the American people, viz:

✦ ✦ ✦

"DEEPLY rooted in the national character are certain basic concepts which mark us as pioneers in the progress of civilization. These are, in broad terms:

"1. That it is right and desirable to have and rear children and that the national population should increase.

"2. That it is right and desirable that the standard of living be steadily improved, and hence that the national income should be continuously enlarged at a more rapid rate than the growth of population.

"3. That it is right and desirable that social gains should be made in the elimination of child-labor, in the broadening of education, in the increase of time free from toil for cultural improvement and in relief of labor from arduous, hazardous and emotionally unsatisfactory occupation.

✦ ✦ ✦

"FROM the standpoint of these fundamental concepts we are sadly undermechanized. We are unable to maintain our rate of population growth while improving the standard of living and enlarging social gains. For the want of adequate mechanization and a sounder philosophy of political economy, we are compelled to sacrifice population growth and the standard of living for social gains at one time, and, at another, to yield something from population growth and social gain for the sake of the standard of living. At no period in our history have we succeeded in a balanced advance in all three respects. We have not made anything like the technological advances necessary to that end. If we are to do so, we must correct not only a reactionary politico-economic philosophy but achieve also a new degree of mechanization as yet scarcely visioned."

CONTACT

✦ ✦ ✦

HAVE you a patent, a process or even a workable idea of value to the Wire Industry?

✦ ✦ ✦

THROUGH the services of a well-known wire and spring trades engineer, developments of definite value may be advantageously placed before interested prospects.

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I WILL represent you on a straight fee or royalty percentage basis.

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ALL dealings will be held in the strictest confidence.

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BOX 112

WIRE & WIRE PRODUCTS

Stamford Trust Bldg.

STAMFORD, CONN.

4,242 Strands in Same Diameter Telephone Cable Made Possible By Improved Insulation

ENGINEERS of the Bell Telephone System and Western Electric Company have developed a cable containing 4,242 separately insulated copper wires, as compared with the previous maximum for one cable of 3,636 wires, it was announced yesterday.

✦ ✦ ✦

DESPITE the increase in the number of wires, the new cables has the same diameter as its predecessor, two and five-eighths inches, and the diameter of each wire in the cable is the same.

✦ ✦ ✦

"THE feat of placing 606 more wires within the same girth was made possible by an improved technique of wire insulation invented by the Western Electric Company, a method which reduced the thickness of the insulation surrounding each strand," it was said in a statement issued by the company. "There was thus produced a covered wire with a diameter of 31-1000th of an inch, compared to the former diameter of 34-1000th. The decrease was only 3-1000th of an inch but this tiny saving, repeated 3,636 times, resulted in a total saving of space sufficient to afford room for the additional wires.

✦ ✦ ✦

"THE method of insulating the wires is in itself a revolutionary development of the last decade. Previous to the invention of this process, wires intended for cable had been insulated by wrapping paper ribbon spirally around them. Then it was discovered that paper pulp could be formed around the wire, and now giant machines literally manufacture a thin coating paper right on the wire, sixty strands at once, as they pass through a bath of pulp."

✦ ✦ ✦

THE first installation of the new cable took place when 14,000 feet of it, manufactured at the Kearny, N. J., works of the Western Electric Company, were installed in the Jersey City area by the New Jersey Bell Telephone Company.

NEW 99% SOAP INSURES CORRECT LUBRICATION

Nopco's new Soap LX has been prepared especially for the dry drawing of steel wire. Its superiority is due to its actual soap content—99% active dry soap.

Because of this high pure soap content, Nopco Soap LX possesses plus values that will effect economy in your drawing operations.

Free from glycerine, salt or fillers of any kind, Nopco Soap LX insures correct lubrication with longer die life, better finish and higher yields per pound of soap.

Write for a Technical Data Bulletin or better still, order enough for a trial—see for yourself.

REG. U. S. NOPCO PAT. OFF.

NATIONAL OIL PRODUCTS CO.

HARRISON, N. J.

BOSTON • CEDARTOWN GA • CHICAGO • SAN FRANCISCO

Dies for
High Speeds
Long bearing Dies
Short bearing Dies
Special bearing Dies

FAMOUS
WIRE DRAWING DIAMOND DIES

VIANNEY

250 E. 43rd St. • New York

Largest Stocks in U.S.A.
Quickest Deliveries
Safest Guarantees
Best Selections
Lowest
Costs

RODINE
PERFECTS PICKLING

Just a little RODINE in the pickling bath saves metal, saves acid, saves fuel, prevents embrittlement, keeps down acid spray, and gives better pickling—at less cost. Write for Bulletin 13-L.

If you have any metal-treating problem—pickling, cleaning, rust-proofing under paint—we will gladly work with you to solve it.

American Chemical Paint Co.
Box 306, AMBLER, PENNA.
Detroit, Mich. Walkerville, Ont.

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Tannate
LEATHER PACKINGS

FLANGE LEATHERS
U-LEATHERS V-LEATHERS
CUP LEATHERS

J. E. RHOADS AND SONS
Established 1702
35 N. Sixth St., Philadelphia, Pa.
New York, Chicago, Atlanta, Cleveland
Factory and Tannery, Wilmington, Del.

The New Royle Plastics Extruding Machine

SOME years ago, in the comparatively simple manufacture of casein buttons, the Royle Extruding Machine made by John Royle & Sons of Paterson, N. J., first gained favor with plastics engineers. The feed screw of a standard rubber extruder was altered slightly to compress and carry forward the casein compound more efficiently. Before long, standard Royle rubber machinery was in use in the leading plastics plants, the vagaries of such compounds as cellulose nitrate being controlled by running at slow speeds through auxiliary gear reduction equipment.

✦ ✦ ✦

RECENTLY much of the secrecy surrounding the manufacture of plastics has been dissipated. Leading producers have joined with us in designing machinery for the efficient extrusion of many thermoplastics. The intimate chemical knowledge of the compounder, coupled with our sixty years' experience in the development of rubber extrusion equipment has made a happy combination resulting in a greater advance in one year than had been possible in the secrecy and mystery of the preceding ten.

✦ ✦ ✦

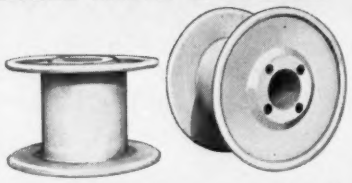
THROUGH the use of Royle Extruding Machines, **continuous** extrusion of resin compounds is successfully accomplished using feed screws and die heads substantially the same as those long used for rubber.

✦ ✦ ✦

Royle Extruders

THE screw type extruder consists briefly of a cylinder through which a specially designed conveyor screw carries material fed into one end of the cylinder to and through a die at the opposite end. The screw thoroughly masticates and compresses the compound and the product emerges in continuous lengths, the form of the die determining the shape of the product.

APCO MOSSBERG
STEEL REELS & SPOOLS



For The Copper, Steel, & Wire Rope Industry

Apco Mossberg Steel Reels are standard equipment in the wire industry—and for good reason! Apco Mossberg—the original Frank Mossberg Co.—**originated** the steel reel idea and have been training workmen in their manufacture ever since. Personal attention by Apco Mossberg engineers make each job a "special".

FREE ENGINEERING SERVICE
We will gladly submit drawings, blueprints, or suggestions without obligation to you. Write for quotation today.

APCO MOSSBERG CO.
(The Original Frank Mossberg Co.)
21 Lamb Street, Attleboro, Mass.

BALLOFFET

Diamond Dies

Skill and accuracy in manufacture with the use of selected stones make Balloffet Diamond Dies the choice of the most critical users.

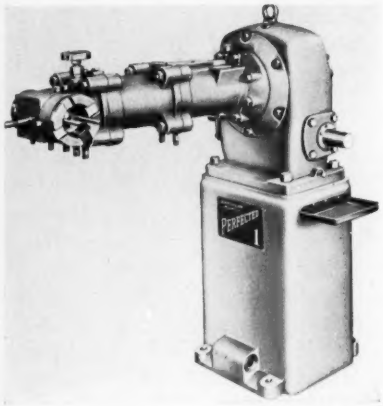
•

Quality Diamond Dies Since 1870

BALLOFFET DIES AND NOZZLE CO., INC.
45-47 Adams Street
Guttenberg, New Jersey

THE machine is used to make rods, tubes and channels; to insulate wire and to cover hose and rollers. The extruding machine is also used to remove particles of foreign matter from stocks by straining them through mesh wire or gauze.

✦ ✦ ✦



THE design of these Extruding Machines includes many refinements promoting speed and quality in production together with long machine life and low maintenance cost. Power is applied through a flexible coupling from the motor which is securely mounted on a sturdy base solidly connected and aligned with the machine. The two smallest extruders utilize multiple V-belt coupling between motor and gear unit. Gear reduction is by fully enclosed worm or compound herringbone gear, running on anti-friction bearings, self lubricated. Feed screw thrust is absorbed by an adequate roller bearing. The screw shoulder bearing is of hard bronze.

✦ ✦ ✦

ROYLE cylinders are step-cored for positive circulation of steam, water or other media used for temperature control. Heads are also cored. For rubber, the machine is furnished with an assembly of valves, on top the cylinder facing the operator, for controlling the head and cylinder separately.

(*Please turn to Page 494*)

Learn about PARALAN

Paralan will give your finished wire and wire products protection from atmospheric corrosion in the mill and in shipping. Paralan-coated wire can be spot welded or soldered without cleaning. Also, Paralan leaves surfaces in good condition for all types of finishes—enameling, japanning, lacquering, plating, etc.

Write for further information. We may be able to solve your difficulties.

AMERICAN LANOLIN CORP.
LAWRENCE, MASSACHUSETTS

WIRE NAIL MACHINERY

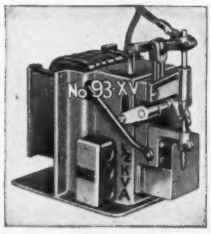
These machines are made in eleven different sizes. This enables us to cover any size of nail most efficiently.

GLADER Nail making machines have been adopted as standard equipment in all recent major nail mill installations.

For further information, prices, etc., write to us.

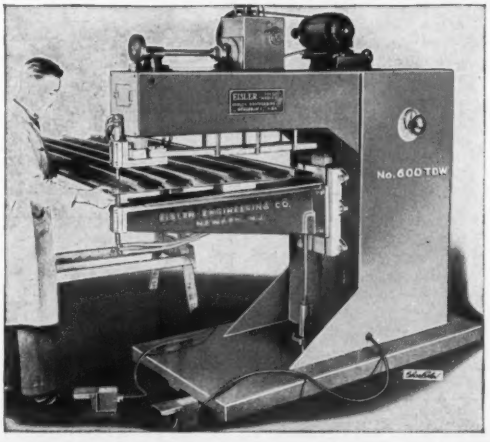
Wm. Glader Machine Works
210 N. RACINE AVENUE, CHICAGO, ILL.

Bench Spot Welder
Foot Operated



We manufacture Electric Welders from ¼ to 500 KVA. Special and Standard Types. WE MAKE A VERY LARGE VARIETY of Welders. Why not ask for more information or a catalog?

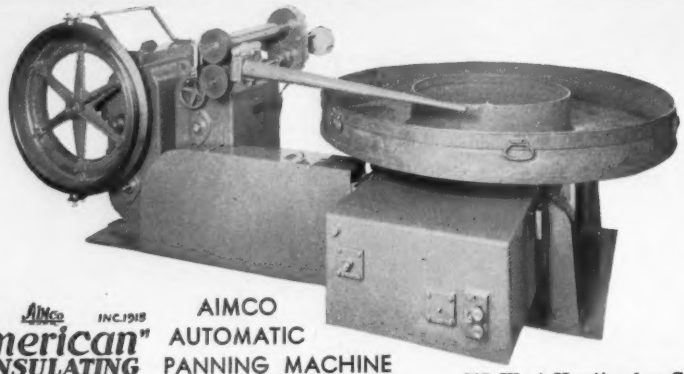
EISLER ENGINEERING CO.
760 S. 13th St. (Near Avon Ave.)
Newark, New Jersey



INVENTIONS — PATENTS

Interesting booklet, **General Information Concerning Inventions and Patents** and **Schedule of Government and Attorneys' Fees,** sent free on request. Simply ask for "booklet" and "fee schedule".

Lancaster, Allwine & Rommel
Registered Patent Attorneys
438 Bowen Bldg. Washington, D. C.

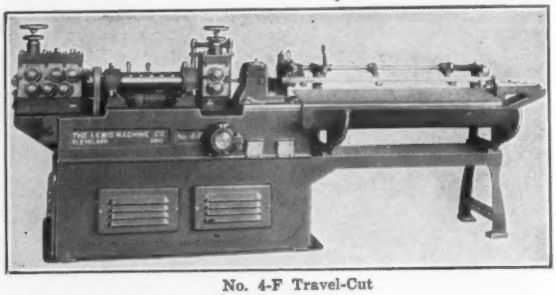


EST. 1865 AIMCO INC. 1918
"American" INSULATING MACHINERY COMPANY
REG. U.S. PAT. OFF.

AIMCO
AUTOMATIC
PANNING MACHINE
Ball Bearing
For Rubber Covered Wire

517 West Huntingdon St.
PHILADELPHIA PENNSYLVANIA U.S.A.

LEWIS Wire Straightening and Cutting Machines
—Automatic—High Speed—Heavy Duty—



No. 4-F Travel-Cut

Machines to Handle
1/32" to 5/16" Rod
Round - Square - Flat - Hex
Ferrous and Non-Ferrous

Write For Bulletin

The Sign of Dependable Service:
WE CAN SUPPLY AND ENGINEER OUR TOOLS EQUIPPED WITH
CARBOLOY CEMENTED CARBIDE

THE LEWIS MACHINE CO., 3440 E. 76 ST., CLEVE., O.

STEELSKIN

REG. U. S. PAT. OFFICE

For High or Low Carbon Wire

WIRE DRAWING SOAPS

Established 30 years

R. H. MILLER CO., Inc. Homer, N. Y.

Try WAYNE Wire Dies

Wire Drawing Diamond Dies

Wire dies by Wayne embody all the essentials necessary (quality stones — experienced workmanship — the most rigid of inspection) to assure accuracy plus long-life at high speed. Try Wayne dies today—see for yourself why drawers of wire acclaim *"Wayne the best die value obtainable."*

WRITE TODAY FOR OUR PRICES

Wayne Wire Die Co., Inc. 57 SHERIDAN ST., IRVINGTON, NEW JERSEY

The New Royle Plastic Extruding Machine

(*Continued from Page 493*)

THE entire machine is ruggedly built and carefully assembled in a rigid unit on a sturdy base. Cylinder liners and feed screws are available in various materials and finishes, thus accommodating a wide range of compounds.

✦ ✦ ✦

The New Royle Resin Die Head

BASICALLY the Royle Resin Head is a die-supporting member where the plastic material — having been brought forward through the cylinder by the feed screw—is forced through the forming die. In this head, we have incorporated adequate passages for the circulation of hot oil and the die-holder is cored to allow temperature control at the very mouth of the die.

✦ ✦ ✦

FOR use with the resin head, a special jacketed cylinder extension and correspondingly longer feed screw are available to provide a longer compression and heating period for the compound. In covering wire or other forms, the form is introduced into the head at right angles to the cylinder, passing through the head and emerging from the die at the opposite side.

✦ ✦ ✦

THIS new Resin Die Head is being used with excellent results in the production of resin-covered wire. Its future usefulness no doubt includes the continuous extrusion of rods, tubes, channels and other solid or hollow forms. We visualize the use of this head in applying attractive plastics covering to otherwise purely utilitarian parts. Thus, the strength and rigidity of steel may conceivably be sheathed in a luxurious coat of gleaming plastic. Then may be obtained noise-deadening, translucence, depth of color, softness and warmth to the touch and other qualities of plastics not attainable by the use of enamel and other finishes.

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No Furnace Needed in New Continuous Wire Annealing

NEW tricks making possible the continuous annealing of single strands of copper wire while racing through **open** gas flames at rates up to 1,000 feet per minute promise to "help to do away with long tedious annealing cycles in bulk", according to W. M. Hepburn, Vice President and Chief Engineer, Surface Combustion Corporation, Toledo, who announces a test run of 10 to 20,000 pounds of wire just begun through new equipment developed jointly by his company and the Syncro Machine Co., Newark, N. J.

✦ ✦ ✦

ESSENTIALLY the apparatus consists of a long row of extremely accurately controlled gas flames — with positioning dies spaced along the length of the row so that the wire passes through just that portion of each flame in which combustion has advanced to the point where both temperatures and burning gas compositions are "just right" for the anneal. Adjustment is provided by the height and character of the flames as well as by the speed of the wire along its flaming route. The unit now in operation uses a line of special gas jets 9 feet long, although it is planned to boost this length to 27

(*Please turn to Page 496*)

Continuous Straightening and Cutting Machinery
With
FLYING SHEAR
for round and shaped wire.
✦ ✦ ✦
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THOMASTON CONNECTICUT

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ZINC WIRE
THE PLATT BROS. & CO.
WATERBURY, CONN.

No Furnace Needed in New Continuous Wire Annealing

(*Continued from Page 495*)

feet and step up wire velocities accordingly. The result will be multiplied production.

✦ ✦ ✦

THE mechanism for the spooling and un-spooling of wire is understood to be quite ingenious. Further, all equipment is automatically regulated by the resultant anneal through a continuous, indicating "anneal meter" at the finish end of the unit. This gadget, according to reports, functions to "feel" the "texture" of the wire surface as it leaves the annealing burner.

✦ ✦ ✦

"THIS new equipment can be used for annealing alone, or for annealing, pickling and coating (principally tinning)", indicates E. G. de Coriolis, Research Director for Surface Combustion, "in which case, coatings are sprayed on as the wire flys by rather than applied by dipping. Only because modern gas combustion is susceptible to such nicety of control and constancy of predetermined flame characteristics, is the development feasible", he continues.

✦ ✦ ✦

ANOTHER dollar-saving virtue of the new apparatus, it is claimed, is that it results in a more uniform anneal than is attainable in batch and even many continuous operations. The general previous practice has been to anneal the wire in spools, necessitating a rather carefully controlled soaking period to produce uniform results from the surface to the core of the spool.

✦ ✦ ✦

HOW widely continuous open-flame annealing will be applicable in wire mills cannot be predicted at this sitting, but it is expected to save considerably in equipment, maintenance, space, and time wherever the process is found practicable.

The Annual Convention of The Wire Association will be held at Chicago, Ill., October 23-27, 1939.

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National Oil Products Co., Harrison, N. J.

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Mossberg Pressed Steel Corp., Attleboro, Mass.

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Magnus Chemical Co., Garwood, N. J.

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Kelly Wire Die Corp., New York, N. Y.
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Vianney Wire Die Works, New York, N. Y.
Wayne Wire Die Co., Inc., Irvington, N. J.

DIES—Lead Extrusion
John Robertson Co., Brooklyn, N. Y.

DIES—Repairs & Re-Cutting
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Rusch Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York, N. Y.
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Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York, N. Y.

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Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
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Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
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Vianney Wire Die Works, New York, N. Y.

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Vaughn Machinery Co., Cuyahoga Falls, O

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DRUMS—Vulcanizing
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MACHINERY—Brazing
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MACHINERY—Bunching
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Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

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Sleeper & Hartley, Inc., Worcester, Mass.

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Syncro Machine Co., Rahway, N. J.

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Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

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Watson Machine Co., Paterson, N. J.

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Torrington Mfg. Co., The, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.

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National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Broden Construction Co., Cleveland, O.
Hallden Machine Co., Thomaston, Conn.
Lewis Machine Co., The, Cleveland, O.
National Machinery Exchange (Used), New York, N. Y.
H. J. Ruesch Machine Co., Newark, N. J.
F. B. Shuster, New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Stranding
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Swaging
National Machinery Exchange (Used), New York, N. Y.
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Taping
American Insulating Mach'y. Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Testing
Scott, Henry L., Co., Providence, R. I.
Entwistle, James L., Pawtucket, R. I.

MACHINERY—Testing Size of Wire
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y. Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Trolley Wire
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
H. J. Ruesch Machine Co., Newark, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Welding Wire
Eisler Engineering Co., Inc., Newark, N. J.
Micro Products Co., Chicago, Ill.
F. B. Shuster Co., New Haven, Conn.
Thomson-Judd Wire Machinery Co., Lynn, Mass.

MACHINERY—Winding
American Insulating Mach'y. Co., Phila., Pa.
Entwistle, James L., Pawtucket, R. I.
Fidelity Machine Co., Philadelphia, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Drawing
American Insulating Mach'y. Co., Phila., Pa.
Broden Construction Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
H. J. Ruesch Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Wire Measuring
Durant Mfg. Co., Milwaukee, Wis.
Watson Machine Co., Paterson, N. J.

WHERE TO BUY, Continued

MACHINERY—Wire Rope
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Tinning
American Insulating Mach'y. Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Wood Screw
National Machinery Exchange (Used), New York, N. Y.

MILLS—Tandem Rolling and Edging
Torrington Mfg. Co., The, Torrington, Conn.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Hudson Wire Co., Ossining, N. Y.
Seymour Mfg. Co., Seymour, Conn.

PACKING—Tannate Leather
Rhoads & Sons, J. E., Philadelphia, Pa.

PANS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

PAPER—Insulating
E. W. Twitchell, Inc., Phila., Pa.

PAPER TESTERS—
Scott, Henry L., Co., Providence, R. I.

PATENT ATTORNEYS—
Lancaster, Allwine and Rommel, Washington, D. C.

PICKLING COMPOUNDS
American Chemical Paint Co., Ambler, Pa.
National Oil Products Co., Harrison, N. J.

PIPING AND FITTINGS—Acid Resistant
Duriron Co., Inc., The, Dayton, O.

PLASTIC TESTERS—
Scott, Henry L., Co., Providence, R. I.

POTS—Lead Melting
John Robertson Co., Brooklyn, N. Y.

PRESSES—Hydraulic and Mechanical
John Robertson Co., Brooklyn, N. Y.

PRESSES—Lead
John Robertson Co., Brooklyn, N. Y.

PULLERS—Wire
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

PUMPS—Hydraulic
John Robertson Co., Brooklyn, N. Y.

RECORDERS—Fault and Reel
Entwistle, James L., Pawtucket, R. I.

REEL AND TENSION STAND—
Fidelity Machine Co., Philadelphia, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS—Annealing and Stranding
Apco Mossberg Corp., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS—Steel
Apco Mossberg Corp., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS—Takeoff
Apco Mossberg Corp., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.

REELS AND SPOOLS—Shipping and Shop
Apco Mossberg Corp., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS—Vulcanizing and Impregnating
Apco Mossberg Corp., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products, Co., Niles, O.

REELS—Wire Drawing
Apco Mossberg Corp., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products, Co., Niles, O.

REFRACTORIES—High Temperature
Norton Co., Worcester, Mass.

ROD BAKERS
Carl-Mayer Corp., The, Cleveland, O.

RODS—Wire—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.

RUBBER AND RUBBER COMPRESSION TESTERS—
Scott, Henry L., Co., Providence, R. I.

RUST PROOF COMPOUND—
American Lanolin Co., Lawrence, Mass.

SHEET—Steel
Continental Steel Corp., Kokomo, Ind.

SKIN PROTECTOR—
Magnus Chemical Co., Garwood, N. J.

SOAPS—Industrial and Wire Drawing
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Homer, N. Y.
National Oil Products Co., Harrison, N. J.
Vanco, Co., The, Manchester, Conn.

SPARK TESTING EQUIPMENT—
Entwistle, James L., Pawtucket, R. I.

SPOOLS—Annealing and Wire Drawing
Apco Mossberg Corp., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Chicago, Ill.

SPOOLS—Shipping and Shop
Apco Mossberg Corp., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Chicago, Ill.

SPOOLS—Steel
Apco Mossberg Corp., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

STAMPINGS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Brass and Non Ferrous
Hudson Wire Co., Ossining, N. Y.

STRIP—Steel
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.

STRIP METAL TESTERS—
Scott, Henry L., Co., Providence, R. I.

SWIFTS—Take-off
Apco Mossberg Corp., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.

TAKE-UPS FOR CABLE, HOSE, LEAD PRESSES AND SHEET RUBBER—
Entwistle, James L., Pawtucket, R. I.

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TANKS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.

TENSILE TESTERS—
Scott, Henry L., Co., Providence, R. I.

TREADS—Safety
Norton Co., Worcester, Mass.

TRUCKS—
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

TUBE BENDERS AND FORMERS—
H. J. Ruesch Machine Co., Newark, N. J.

TURKS HEAD—
Standard Machinery Co., Auburn, R. I.

VALVES AND FITTINGS—Acid Proof
Duriron Co., The, Dayton, O.

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
American Insulating Mach'y. Co., Phila., Pa.

WELDERS—Spot and Butt
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.

WIRE—Cold Heading
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE—Electric
Hudson Wire Co., Ossining, N. Y.

WIRE—Enameled For Coils
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE—Nickel Silver and Phosphor Bronze
Hudson Wire Co., Ossining, N. Y.

WIRE—Non Ferrous to Specification For Special Purposes
Hudson Wire Co., Ossining, N. Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Spring
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.

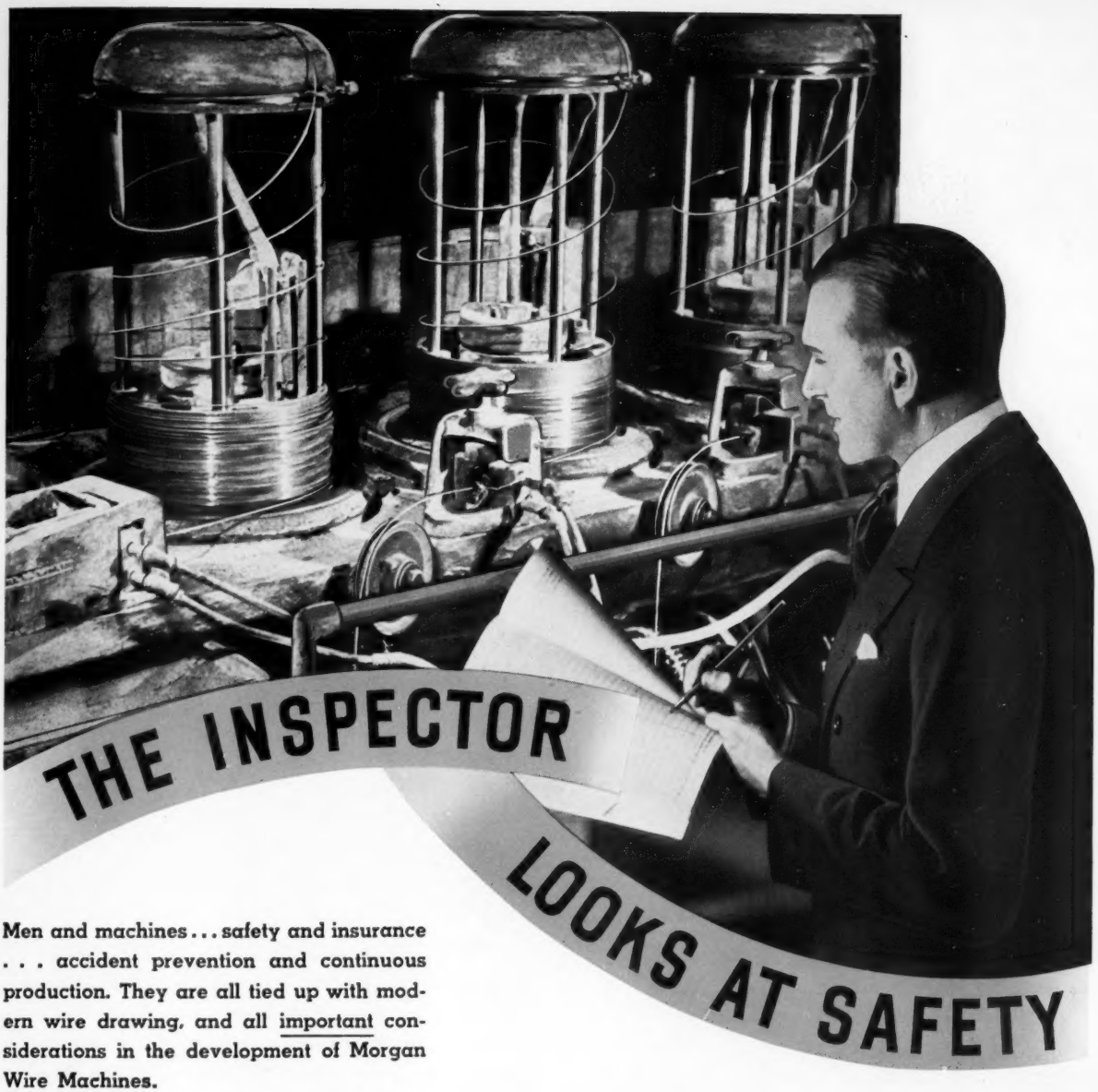
WIRE—Stainless Steel
Firth-Sterling Steel Co., McKeesport, Pa.

WIRE—Steel—Also Coppered Steel——Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE AND STRIP—Zinc
Metal Industry Works, Poland.
Platt Bros. & Co., The, Waterbury, Conn.

WIRE TESTERS—
Scott, Henry L., Co., Providence, R. I.

YARN TESTERS—
Scott, Henry L., Co., Providence, R. I.



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Every precaution is taken to make Morgan-Connor Continuous Wire Drawing Machines ✓ safer, and thus more productive. Each is equipped with a ✓ safety stop bar that runs the full length of the machine, and with an effective tilting type ✓ safety stop. Wire is ✓ restricted to a definite, controlled path. Morgan machines receive the inspector's unqualified O.K.

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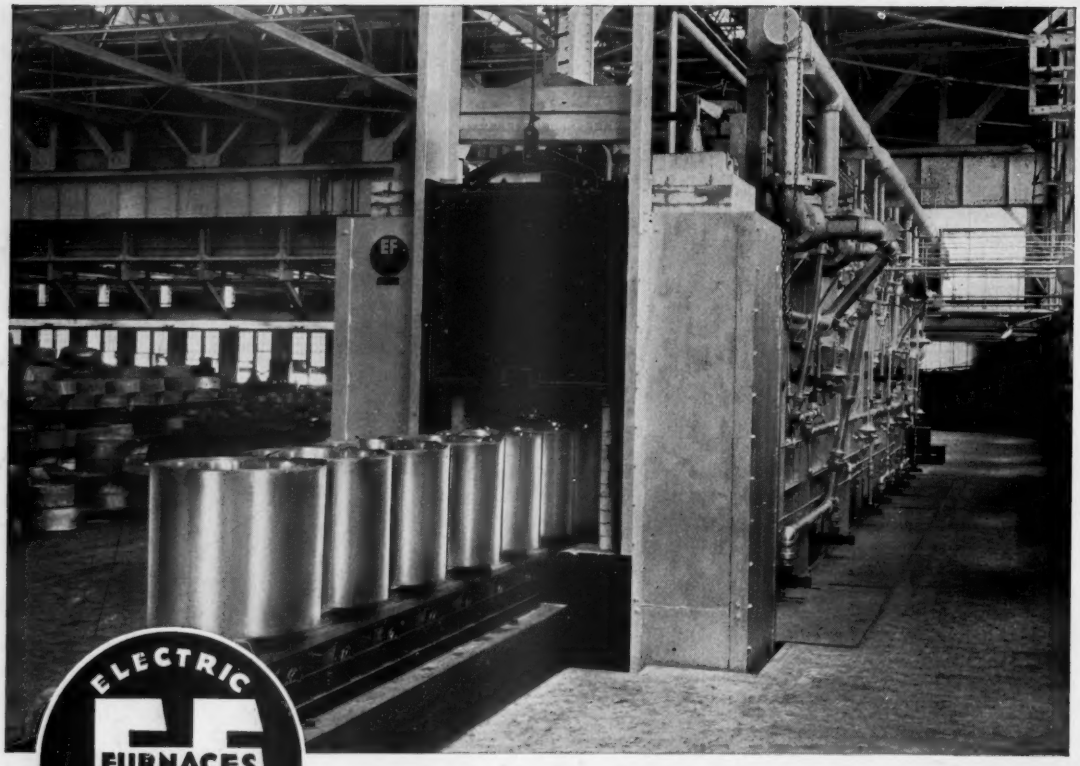
MORGAN *Wire Drawing Machinery*



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Another EF Gas Fired Installation . . .

for Annealing Strip in Coils

Strip—ferrous and non-ferrous—both coiled and in strands—is uniformly annealed in various types of continuous, semi-continuous and batch type, electric and fuel fired furnaces we have built. The above gas fired installation is one of two roller rail, conveyor type furnaces we recently installed in a prominent eastern plant, for annealing large coils of both narrow and wide strip.

These furnaces can be built for any size coils or for any production required.

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